SERIAL Historical Collection V. 1
A 2d-9th meeting
1869-1874
Columbia University
in the City of New York
College of Physicians and Surgeons
Reference Library

Digitized by the Internet Archive
in 2014

https://archive.org/details/transactionsofam1186amer

Minutes of meeting 1868 missed,
only in mss.

THE

TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY.

VOLUME I.

1868-1874.

BOSTON:
FOR SALE BY JAMES CAMPBELL. 18 TREMONT ST.
1875.

INDEX TO VOLUME I OF THE TRANSACTIONS OF THE AMERICAN OTOLOGICAL SOCIETY.*

Abscess of cerebellum following mastoid disease. Morland. [4.34], 174.
Agnew, case of mastoid cell disease.—Trephined. [3.67], 97.
Anatomy and Physiology. Report on Progress Otology, 1874. Burnett. 461–490.
Aneurisn, traumatic, of post. auricular artery. Buck. [6.64], 384.
Angioma cavernosum, polypoid, case of. Buck. [3.75], 105.
Aspergillus, case of. J. Orne Green. [2.23], 23, [3.79], 109.
Assessments, penalty for non-payment of. [5.6], 226.
Auditory nerve, effects of quinine on. Roosa [5.56], 276.
Aural neuralgia. J. Orne Green. 561.
" polypus, with osseous base. Removal. Improvement. O. D. Pomeroy. 541.
Auricle, deformity of from otitis externa. Roosa. [6.123], 443.
" Epithelioma of. J. Orne Green. [3.62], 92.

Bertolet. recurrent fibromata. [4.53], 193.
" Tenotomy of tensor tympani muscle. [6.86], 406.
Bibliographical Record. Rep. on Prog. Otol., 1871. Buck. [4.15], 155.
" " " " " " 1871–72. Blake. [5.46], 266.
" " " " " " 1873. Burnett. [6.59], 379.
" " " " " " 1874. Burnett and Blake. 532.
Blake. Auditory nerve, reaction to galvanic current. [6.114], 434.
" Caries of meat. aud. ext. Recovery. [5.80], 300.
" Distribution of weight in ossicula auditus. 543.
" On corpulence as it affects the hearing. [5.86], 306.
" A middle ear mirror. [5.83], 303.
" Perception of high musical tones. [5.74]. 294.
" Diagnostic value of high musical tones. [6.118], 438.
" Parasitic growths in meatus aud. externus. [4 30], 170.
" Perforation of membrane of Shrapnell in otitis med. pur. 546.
" Report on Prog. Otology, 1871–2 [5.8–46] 228–266.
" " " " 1874, Pathology and Therapeutics, 49[illegible]–522.
Bougie. Eustachian, use of, Weir [3.60] 90.
Buck. Cornu humanum of ext. ear [4.18], 158.
" Polypoid angioma cavernosum [3.75], 105.
" Granulation tissue, ultimate forms of, 534.
" Mastoid abscess from acute otitis media [6.60] 389.
" Mucus in the cavity of the tympanum [6.65], 385.
" Traumatic aneurism of post. auricular artery [6.64], 384.
" Membranous closure of meat. aud. ext. 537.
" Report on Prog. Otology, 1870–1 [4.8–15], 148–155.

* In order to prepare this Index it has been necessary to re-page consecutively the parts for the 3d, 4th, 5th, and 6th meetings, as follows: —
(The part for meeting No. 2, 1869, published with the "Transactions of the American Ophthalmological Society" for that year, commences with page 1 and ends with page 28.)

THE NO. FOR MEETING.	YEAR.	COMMENCES WITH PAGE	ENDS WITH PAGE
No. 3	1870	31	134
" 4	1871	141	216
" 5	1872	221	320
" 6	1873	321	452
" 7	1874	453	Ends with volume.

In the Index, many of the references have two numbers in brackets—for example, "Aneurism, traumatic, of post. auricular artery. Buck. [6.64], 384"—which means that in the published proceedings of the 6th meeting, on the 64th page, the case is recorded: 384 is the new number given to the page in accordance with the above table.

Burnett. Report on Prog. Otology, 1873 [6.9–59], 329–379.
" " " " anatomy and physiology, 1874, 461–490.
" Accidental evulsion of memb. tympani and ossicles [5.50], 270.
" Bibliographical record, 1872–3 [6.59–63], 379–383.
" Constant electric current — paradoxical formula [6.108], 428.
" Deafness for low tones, case of [6.106], 426.
" Ménière's disease, case of, 583.
" Shrapnell's membrane, perforation of, 553.
" A tympanic trephine [6.109], 429.

Caries of meat. aud. ext. after otitis med. supp. Blake. [5 80], 300.
Catheter, Eustachian, a new form of. H. D. Noyes. [3.81], 111.
Cerebellum, abscess of, after mastoid disease. Morland. [4 34], 174
Cerebro-spinal meningitis epidemic, Deafness from. Knapp. [6.128], 448.
Cerumen, impacted, its pathological indication. O. D. Pomeroy. [5 62], 282.
Chorda tympani, irritation of, paralysis of facial nerve, etc. H. D. Noyes. 556.
Cochlea, minute structure and development of Report on Prog., 1872 Gottstein. [5.13], 233.
Condensed air, 60 pounds to square inch, action of on Eustachian tube. J. Green. [3.99], 129.
Congress Otological, the first, at Dresden, 1868. Roosa. Rep Prog. Otol. 1869. [2.15], 15.
Congress, International Otological, in N. Y. in 1876. Resolution regarding. Roosa. [6.8], 328.
Cornu humanum of auricle. Buck. [4.18], 158.
Corpulence, Harvey on effect of, on the hearing. Blake. [5 86], 306.
Corpulence a cause of deafness. Morland. [5.85], 305.
Cutaneous closure of meatus aud. ext Morland. [3.31], 61. Buck. 536.

Deafness in pregnancy and puerperal condition. Morland. [2.17], 17.
Double-hearing with both ears (*diplacusis binauricularis*). Knapp. [2.21], 21.
Douche, nasal, purulent otitis media caused by. Knapp. [2.20], 20.

Electric current, constant, reaction of aud. nerve to, etc. Blake. [6.114], 434.
Electric current, constant, reaction of aud nerve to, etc. Burnett. [6.108], 428.
Epithelioma of auricle J. Orne Green. [3.62], 92.
Eustachian catheter, faucial, new. O. D. Pomeroy. [5.70], 290.
" " for introduction by opposite side. H. D. Noyes. [3.81], 111.
" tube under high pressure of air. J. Green. [3.99], 129.
Evulsion of memb. tymp. and ossicles — accidental. Burnett. [5.50], 270.
Eyelet introduced into memb. tymp. case H. D Noyes. [3.56], 86. Pomeroy. [6.99], 419.

Fibromata, recurrent, of lobes of both ears. Bertolet. [4.53], 193.
Foreign bodies in meat. aud. ext. methods of removal. Morland. [3.71], 101.
Fracture, ununited, of manubrium of malleus. Weir. [3.91], 121.

Galvanic current, reaction, etc. Rep. Prog. Otol. 1872 [5 29], 249.
" " " " Blake. [6.114], 434.
" " " " Burnett [6.108], 428.
Granulation tissue, ultimate forms of. Buck. 534.
Green, J. Aspergillus in ext aud. meatus. [3 79], 109.
Green, J. Eustachian tube under pressure of 60 pounds to square inch. [3.99], 129.
Green, J. Orne. Aspergillus glaucus. [2.23], 23.
" " Epithelioma of auricle and meatus ext. [3.62], 92.
" " Fatal otorrhœa; how it reaches the brain. [4.55], 195.
" " Injury from external violence, cases of. [5.88], 308.
" " Mastoid inflammation, cases of. Rep. Prog. 1874. 512.
" " Neuralgia in and about the ear. 561.
" " Report on progress of otology. 1870. [3.9–29] 39–59.
" " Tenotomy of tensor tympani muscles [6 81], 401.
" " Ulceration of dermoid layer of memb. tympani [6.111], 431.

Hallucinations of hearing in the insane. O. D. Pomeroy. [4.44], 184
Hearing, hardness of, for low tones. Burnett. [6 106], 426.
Hemiplegia coincident with chr. otitis media supp. Cases. Roosa. [3.88], 118.

Impacted cerumen; its pathological indication. O. D. Pomeroy. [5.62], 282.
Inflation by Politzer's method, injection of memb. tymp. from. O. D. Pomeroy. [4 49], 189.
Injury from external violence, cases. J. Orne Green. [5 88], 308.

Kipp. Abscess of mastoid cells, etc. etc. [6.74], 394.
Kipp. Spurious othæmatoma from burn. [6 79], 399.
Knapp. Congenital bony closure of ext. aud. meatus, etc. [3.86], 116.
" Deafness from epidemic cerebro-spinal meningitis. [6.128], 448.
" Double hearing in both ears [2.21], 21.
" Acute pur otitis media, caused by nasal douche. [2.20], 20.

Laight. Necrosis of mastoid cells. [4.20], 160.
Lunatics. Aural examinations in 60. O. D. Pomeroy. [4 44] 184.

Malignant disease of ear. Robertson. [3.35], 65.
Malleus, ununited fracture of manubrium of. Weir. [3.91], 121.
Mastoid abscess from acute otitis media. Buck. [6.69], 389.
" cells, disease of. Case trephined. Agnew. [3.67], 97.
" cells, abscess of, etc. Kipp. [6 74], 394.
" inflammation, cases. J. Orne Green, Rep. on Prog., 1874. 512.
" process in otitis media. Roosa. [3.38]. 68.
" sequestrum, case of, with photograph. O. D. Pomeroy. [5.67], 287.
" trephined, case of otitis med. pur., with sinus into pharynx. Mathewson. 539.
Mathewson. Otitis med. pur., with sinus into pharynx, etc. 539.
Meatus aud. ext. congenital bony closure, etc. Knapp. [3.86]. 116.
Meeting 1874 List of members, 457. Minutes of, 459. Table of contents, 455.
Members, list of, 1870, [3.3], 33; 1871, [4.3], 143; 1872, [5 3], 223; 1873, [6.3], 323.
Membrana tympani, case of reproduction of. Spencer. [4.39], 179.
Ménière's disease, case of. Burnett. 583.
Middle ear, mirror for. Blake. [5.83], 303.
Minutes, 2d meeting, 1869, 3 and 26; 3d meeting, 1870, [3.5], 35; 4th meeting, 1871, [4.5], 145; 5th meeting, 1872, [5.5], 225; 6th meeting, 1873, [6.5], 325; 7th meeting, 1874, 459.
Morland, abscess of cerebellum after mastoid disease. [4.34], 174.
" on corpulence as a cause of deafness. [5.85], 305.
" cutaneous closure of meatus aud. ext., with hyperostosis. [3 31], 61.
" deafness in pregnancy and puerperal condition. [2.17], 17.
" foreign bodies in the ear, methods of removal. [3.71], 101.
Mucus in tympanic cavity. Buck [6.65] 385.
Musical tones, high, diagnostic value of. Blake. [6.118], 438.

Nasal douche, dangers from use of. Knapp. [2.20], 20.
" " how to use. Rev. of Roosa on the ear. Burnett. 526.
Necrosis of mastoid cells. Laight. [4.20], 160.
Nervous deafness unsuccessfully treated by galvanism. Weir. [4.22], 162.
Neuralgia in and about ear. J. Orne Green. 561.
Nitrate of silver, indications for use in ch. pur. otitis med. Pardee. [4.41], 181.
Noyes, H. D. Irritation of chorda tympani, paralysis of facial nerve, etc. 556.
" A new form of Eustachian catheter [3 81], 111.
" Otitis media from use of Eustachian bougie [3.55], 85.

Ossicula auditus, distribution of weight of. Blake. 543.
" " mechanism of, etc. Burnett and al. Report Prog. 1872 [5.24], 244.
Othæmatoma, spurious, from burn. Kipp. [6.79], 399.
Otitis media, pur., acute, caused by nasal douche. Knapp. [2 20], 20.
" " " chronic, character of the secretion in. Pardee. [4.41], 181.
" " " " treatment. Pardee. [4.41], 181.
" " hemorrhagic. Roosa. [5.54], 274.
" " purulent, with sinus into pharynx, mastoid trephined. Mathewson. 539
Otitis media from use of Eustachian bougie. H. D. Noyes. [3.55], 85.
" " pur., chronic, with extension to brain. Case. Webster. 572.
" " " " how it reaches the brain. J. Orne Green. [4.55], 195.

Otological Congress at Dresden, 1868. Rep. Prog. 1869 [2.15], 15.
Otology. Rep. on Prog. of, 1869. Roosa. [2.47], 4–17.
" " " 1870. J. O. Green. [3.9–29], 39–59.
" " " 1871. Buck. [4.8–15], 148–155.
" " " 1872. Blake. [5.8–46], 228–266.
" " " 1873. Burnett. [6.9–59], 329–379.
" " " 1874. Burnett and Blake. 461–533.
Otorrhœa, the course by which it becomes fatal. J. O. Green. [4.55], 195.

Papers, list of, read 1870, [3.6], 36; 1871, [4.5], 145; 1870, [5.5], 225; 1873, [6.6], 326; 1874, 455.
Paracentesis memb. tympani, results of, cases. O. D. Pomeroy. [6.92], 412.
Parasitic growths in external meatus. Blake. [4.30], 170.
Pardee, indication for use of nitrate of silver in ch. pur. otitis med. [4.41], 181.
" steam in treatment of middle ear disease. [3.93], 123.
Pathology and Therapeutics. Rep. on Prog. 1874. Blake. 490–522.
Perception of high musical tones. Blake. [5.74], 294.
Perforation of Shrapnell's membrane in otitis med. pur. Blake. 546.
" " " Burnett. 553.
Politzer's eyelet, use of, cases. O D. Pomeroy. [6.99], 419.
Polypoid angioma cavernosum, case. Buck. [3 75], 105.
Polypus and its treatment, cases. Seely. [4.26], 166.
Pomeroy, O. D., aural examinations of 60 insane patients. [4.44], 184.
" " " polypus, with bony base, case. 541.
" " impacted cerumen, its pathological indication. [5.62], 282.
" " a new facial Eustachian catheter. [5.70], 290.
" " case of mastoid sequestrum, with photographs. [5.67], 287.
" " results of paracentesis of memb. tymp. [6.92], 412.
" " use of Politzer's eyelet, cases. [6 99], 419.
" " tenotomy of tensor tympani muscle. 577.
" " investigations on inflation by Politzer's method. [4 49], 189.
Pregnancy and puerperal condition, deafness in. Morland. [2.17], 17.

Quinine, effects of on auditory nerve. Roosa. [5 56], 276.

Reports on Progress of Otology. See Otology.
Robertson, case of malignant disease of ear. [3.35], 65
Roosa. Deformity of auricle from otitis externa. [6.123], 443.
" Cases of hemiplegia coincident with chr. supp. otitis media. [3 88], 118.
" History of operation for trephining mastoid process. [3.48], 78.
" The mastoid process in otitis media. [3.38], 68.
" Two cases of hemorrhagic otitis media. [5.54], 274.
" Effects of quinine on the ear. [5.56], 276.

Seely. Cases of aural polypus and their treatment. [4 26], 166.
Shrapnell's membrane, perforation of, in otitis med. pur. Blake. 546. Burnett. 553.
Spencer. Case of reproduction of the drum membrane. [4.39]. 179.
Steam in treatment of disease of middle ear. Pardee. [3.93], 123.

Tenotomy of the tensor tympani muscle. J. Orne Green. [6.81], 401.
" " " " " O. D. Pomeroy. 577.
" " " " " , value of. Bertolet. [6.86], 406.
Trephining mastoid process, history of operation for. Roosa. [3.48], 78.
Tympanic trephine. Burnett. [6.109], 429.

Ulceration of dermoid layer of drum membrane. J. Orne Green. [6.111], 431.

Webster. Fatal case of chr. otitis media pur. with extension to the brain. 572.
Weir. On the use of Eustachian bougies. [3.60], 90.
" A case of ununited fracture of the manubrium of the malleus. [3.91], 121.
" Ingrowing hairs from tragus resting on drum membrane. [3.30], 60.
" A case of nervous deafness, treatment by galvanism unsuccessful. [4.22], 162.

PREFACE.

Until within a very few years, the science and art of Otology had been almost entirely neglected by the medical profession of the United States. In this respect, however, we were not much behind most other parts of the civilized world.

In its very best position, Otology was an appendage, not always very gracefully worn, to the Department of Opthalmology; for in this country, as in Ireland, diseases of the Eye and Ear have always been connected, both in the minds of the profession and the laity. The Ophthalmological Society of the City of New York thus has for its object the cultivation of both ophthalmic and aural science.

After the American Ophthalmological Society had proved itself a useful organization, and had become firmly established, the question of amending its constitution so as to admit of the discussion of aural subjects, was considered by the members, nearly all of whom were engaged in the practice of both Ophthalmology and Otology. It was proposed to devote one day of the annual sessions of the Society to aural medicine and surgery; but it was finally decided that such a union could not produce satisfactory results. Consequently, on the 22d of July, 1868, the American Otological Society was organized by certain members of the American Ophthalmological Society, who were then at Newport, Rhode Island, in attendance upon the fifth meeting of the latter. Their names will be found in the minutes of the first meeting, which are printed in this volume.

As will be seen by reference to the record, no scientific business was then transacted; but at each subsequent annual meeting papers have been read and discussions held. It is believed that these articles and debates have contributed essentially to the interest in aural science that now obtains in this country and abroad; and it is confidently hoped that the Otological Society has but just begun a career which is to continue so long as medical science is cultivated.

November 3, 1874.

TRANSACTIONS

OF THE

American Otological Society.

Second Annual Meeting,

Newport, R. I., July, 1869.

AMERICAN OTOLOGICAL SOCIETY.

The second annual meeting of the American Otological Society was held at the Atlantic Hotel, Newport, R. I., on Tuesday, July 20th, 1869.

The following members were present:

Dr. John H. Dix	Boston, Mass.
" J. Orne Green	" "
" D. B. St. John Roosa	New York, N. Y.
" Wm. F. Holcomb	" "
" R. F. Weir	" "
" H. D. Noyes	" "
" John Green	St. Louis, Mo.
" E. L. Holmes	Chicago, Ills.
" C. E. Rider	Rochester, N.Y.

In the absence of the President, Dr. John H. Dix was elected President, *pro tem.*

Dr. H. Knapp, of New York, was invited to take part in the scientific business of the Society.

The minutes of the last meeting were read and approved.

The following Committee of Membership was appointed by the President, viz., Drs. Holmes, Holcomb, Roosa, J. Orne Green and Rider. On recommendation of this commitee the following gentlemen were elected members, viz.:

Dr. C. J. Blake	Boston.
" H. S. Shaw	"
" H. Knapp	New York.
" H. G. Newton	Brooklyn.
" J. S. Prout	"
" W. W. Seely	Cincinnati.
" Frank Abbott	Buffalo.
" J. W. Lawton	Syracuse.

Dr. Knapp took his seat as a member of the Society.

On motion of Dr. Roosa, it was resolved that the President appoint a committee of three to present an order of business.

Drs. Weir, Roosa and J. Orne Green were appointed such committee, which was further instructed by the Society to nominate officers for the ensuing year.

The report of the Treasurer was read and accepted.

Acting on the report of the Committee on the Order of Business, the Society listened to the reading of (1) the Report on the Progress of Otology, by Dr. D. B. St. John Roosa.

Report on the Progress of Otology. By D. B. St. John Roosa, M. D., of New York.

Mr. President and Gentlemen:

The progress in otological science during the last year, although not marked by any grand discovery, has been substantial and far from insignificant. Here and there points have been opened up in the field which promise much from future investigation, while in some other instances subjects of importance have been fully investigated.

The new era of otology—for we may be said to be in a new era—dates from the introduction of a generally practicable mode of examining the membrana tympani (Tröltsch), and from the simplification and amplification of our means of opening the Eustachian tube (Politzer). We now stand, as regards the diagnosis and treatment of diseases of the outer and middle ear, on a position as fully advanced as that of any other department. We are still, however, sadly in need of more perfect means for the differential diagnosis of affections of the middle and internal ear, and of positive ideas as to the treatment of affections of the nervous apparatus. If it be true that he who appreciates his ignorance is not far from the path of knowledge, we may hope for speedy advancement in the latter named department of otology, since we are all in accord as to the direction in which it is to be made.

In discharging the duty which by your favor has devolved upon me, I may be permitted to go back a little further than the date of our organization in noting the advances made in

TRANSACTIONS

OF THE

American Otological Society.

Second Annual Meeting,

Newport, R. I., July, 1869.

AMERICAN OTOLOGICAL SOCIETY.

The second annual meeting of the American Otological Society was held at the Atlantic Hotel, Newport, R. I., on Tuesday, July 20th, 1869.

The following members were present:

Dr.	John H. Dix	Boston, Mass.
"	J. Orne Green	" "
"	D. B. St. John Roosa	New York, N. Y.
"	Wm. F. Holcomb	" "
"	R. F. Weir	" "
"	H. D. Noyes	" "
"	John Green	St. Louis, Mo.
"	E. L. Holmes	Chicago, Ills.
"	C. E. Rider	Rochester, N.Y.

In the absence of the President, Dr. John H. Dix was elected President, *pro tem.*

Dr. H. Knapp, of New York, was invited to take part in the scientific business of the Society.

The minutes of the last meeting were read and approved.

The following Committee of Membership was appointed by the President, viz., Drs. Holmes, Holcomb, Roosa, J. Orne Green and Rider. On recommendation of this commitee the following gentlemen were elected members, viz.:

Dr.	C. J. Blake	Boston.
"	H. S. Shaw	"
"	H. Knapp	New York.
"	H. G. Newton	Brooklyn.
"	J. S. Prout	"
"	W. W. Seely	Cincinnati.
"	Frank Abbott	Buffalo.
"	J. W. Lawton	Syracuse.

Dr. Knapp took his seat as a member of the Society.

On motion of Dr. Roosa, it was resolved that the President appoint a committee of three to present an order of business.

Drs. Weir, Roosa and J. Orne Green were appointed such committee, which was further instructed by the Society to nominate officers for the ensuing year.

The report of the Treasurer was read and accepted.

Acting on the report of the Committee on the Order of Business, the Society listened to the reading of (1) the Report on the Progress of Otology, by Dr. D. B. St. John Roosa.

Report on the Progress of Otology. By D. B. St. John Roosa, M. D., of New York.

Mr. President and Gentlemen:

The progress in otological science during the last year, although not marked by any grand discovery, has been substantial and far from insignificant. Here and there points have been opened up in the field which promise much from future investigation, while in some other instances subjects of importance have been fully investigated.

The new era of otology—for we may be said to be in a new era—dates from the introduction of a generally practicable mode of examining the membrana tympani (Tröltsch), and from the simplification and amplification of our means of opening the Eustachian tube (Politzer). We now stand, as regards the diagnosis and treatment of diseases of the outer and middle ear, on a position as fully advanced as that of any other department. We are still, however, sadly in need of more perfect means for the differential diagnosis of affections of the middle and internal ear, and of positive ideas as to the treatment of affections of the nervous apparatus. If it be true that he who appreciates his ignorance is not far from the path of knowledge, we may hope for speedy advancement in the latter named department of otology, since we are all in accord as to the direction in which it is to be made.

In discharging the duty which by your favor has devolved upon me, I may be permitted to go back a little further than the date of our organization in noting the advances made in

our knowledge, and thus include some of the noteworthy productions in otological literature which have appeared in the past eighteen months.

THE AURICLE.—Dr. Voltolini,[1] of Breslau, contributes an interesting article on the anatomy and physiology of the auricle. The auricle is to be considered as a reflector, condenser and conductor of the waves of sound. As a reflector it may be considered as composed of two parabolas, lying concentrically to each other. The outer parabola, the fossa of the concha, throws the undulations of sound against the inner, the tragus, whence they pass into the auditory canal. Where the auricle is small the concha is deep, in order to compensate for the loss. The auricle not only reflects, but also condenses the sound. It is also a conductor. If it were simply a reflector and condenser, it would be better adapted to its purpose if composed entirely of bone. Voltolini considers the auricle as an external membrana tympani. We know that the chief function of the true membrana tympani is to facilitate the conduction of the sound-waves from the air to certain fixed bodies. The change from one medium to another of course causes these waves to lose some of their intensity. The auricle is really a membrane, although a thick one. Muscular movement of the auricle is not made by human beings, because there is such a variety of convolutions in the part, that, come which way the waves of sound will, they fall perpendicularly to the tangent of one of those irregularities, and they are therefore well taken up. The auricle must be an important part of the auditory apparatus, because it is so well developed at birth.

The idea promulgated in the anatomical text-books, that the muscles become atrophied by wearing caps in childhood, must be incorrect, for those who observe children will see that the caps do not injure the ears at all, and, as Hyrtl says, the beasts cannot voluntarily move their ears any better. But if the voluntary movement be slight, the same cannot be said of the involuntary, which is the principal movement even in animals, as Schroeder van der Kolk has shown in his essay on the func-

[1] Monatsschrift für Ohrenheilkunde, Jahrgang ii., No. 7.

tions of the medulla oblongata. The author then proceeds to prove that the action of the muscular structure is chiefly of a reflex nature, just as the true membrana tympani is placed in different degrees of tension by the tensor tympani muscle. The reflex movements of the auricle may be seen in syringing the ear. We may also observe, in very many patients, that if we hold the watch on the outermost tip of the auricle it is heard; but if we remove it but one line, its tick is no longer perceived. The auricle is the sound receiver of a hearing trumpet, of which the external auditory canal is the tube, and since the muscle is very large in proportion to the breadth and length of the tube, we can see what nonsense it is to recommend hearing trumpets that are much smaller than the auricle.

Aspergillus.—The subject of the growth of vegetable parasites or fungi in the external auditory canal may now be said to be thoroughly worked up through the labors of Wreden,[1] Schwartze,[2] J. Orne Green,[3] of Boston, Mayer, and Hassenstein and Hillyer.[4] The aspergillus flavescens, glaucus and nigricans, as well as the stamphyllium polymorphum, have been found in the auditory passage, and are known to produce an obstinate external otitis and myringitis, which of course can only be cured by killing the parasite. The instillation of solutions of tannin, bi-chloride of mercury, lead, carbolic acid and similar agents, combined with faithful removal of the fungus by the syringe and forceps, have finally destroyed the growths and relieved the symptoms. Dr. Wreden's cases, with his remarks, form a monograph, with which the Society is undoubtedly familiar. In regard to the etiology Dr. Wreden says: "All these varieties of aspergillus, according to my view, are only varieties of the ordinary mould fungus." The origin of some of Dr. Wreden's cases could be traced to the damp walls of unventilated rooms, kept shut during the long Russian winter.

---

[1] Die Myringomykosis Aspergillina, St. Petersburg, 1868.

[2] Archiv für Ohrenheilkunde, B. iv., Heft ii.

[3] Boston Medical and Surgical Journal, Nov. 19, 1868.

[4] Archiv für Ohrenheilkunde, Band iv., Heft iii., p. 162.

Exostosis.—Bonnafont[1] has recorded a case of true exostosis of the external auditory canal, not the result, so far as the history shows, of suppurative inflammation in the middle ear and subsequent periostitis, as previous investigations have proven these growths to be.[2] By the use of a small rat-tail file the tumor was broken off and a permanent opening made, which relieved the impairment of hearing which the obstruction caused. Laminaria was at one time used to dilate the opening, but it caused much pain, and it was very difficult to remove.

Diffuse Inflammation of Meatus.—Dr. Weber,[3] of Berlin, advises the use of cold compresses in the diffuse variety of inflammation of the external meatus. The use of such compresses should be continued from one to three hours. His experience is quite the reverse of nearly all that has been published on this subject, cold applications being usually considered as very injurious to the ear.

Rivinian Foramen.—In a discussion in one of the medical societies of Vienna,[4] Gesellschaft der Aertze, Prof. von Patruban, Drs. Gruber and Politzer unite in affirming the existence of the Rivinian foramen, as rediscovered by Bochdalek of Prague.

Membrana Tympani.—Dr. Moritz Popper[5] has recently made some investigations in regard to the vessels of the membrana tympani, with the advantage of a more thorough method of injection than that hitherto employed.

The membrane receives blood from two sources, the vessels ramifying on the walls of the external auditory canal and the vessels in the mucous membrane of the middle ear. The vessels from the former source ramify in the outer sub-epidermoidal layer, those of the latter in the inner sub-epithelial layer. The middle layer of the membrane contains no vessels except on the periphery, where there is an anastomosis

---

[1] Archiv für Ohrenheilkunde, B. iv., No. 4. Monatsschrift, Band ii , No. 8.
[2] New York Medical Journal, Vol ii , p. 424.
[3] Monatsschrift für Ohrenheilkunde, Jahrgang iii., No. 1.
[4] Ibid., iii. Band, No. 1.
[5] Ibid., iii. Band, No. 5.

between the vessels of the outer and inner layer. The vessels of the outer layer form long loops, which appear in the papillæ lying along the course of the handle of the malleus, beginning almost at the lower extremity, and passing into the papillary layer of the walls of the external auditory canal.

Eustachian Tube.—The much discussed question of the constant and normal patency of the Eustachian tube is again agitated by Weber,[1] of Berlin, who, supported by the investigations of Rudinger and Mayer, claims that the canal is constantly open in the upper portion of its caliber—that is to say, in the so-called hook cartilage portion.

Dr. Rebsamen,[2] of Zurich, concludes from his observations that the opening of the cartilaginous portion during the action of swallowing does not result from the force of one muscle alone—the variously called tensor palati, abductor tubæ, or dilator veli—but that it is the result of the combined action of a number of pharyngeal muscles.

Voltolini placed himself in the pneumatic cabinet of Lowenstein of Berlin, which is essentially a chamber in which the air is compressed by means of a pump, and he found, when the first stroke of the pump was made, that his hearing was greatly diminished, as shown by the watch, although the conduction of sound through the bones of the head was not interfered with. The pressure upon the membrana tympani became so great that the experimenter felt himself almost impelled to open the ventilator, but he restrained himself and swallowed, which relieved the sensation so that he was able to hold out for some time longer. The experiment reaffirmed Toynbee's discovery that at every action of swallowing the tube is opened, and that an equalization of the air in the cavity of the tympanum with that of the atmosphere takes place. Voltolini also believes that the air is pumped through the tube into the cavity at each opening of the pharyngeal orifice, the tube being, as it were, the barrel of the pump. The experimenter goes on to show, by experiments upon himself, that the soft palate not only lifts up on the motion of swallowing, but that it also makes a rotary

---

[1] Monatsschrift für O., Band ii., No. vi. et seq.

[2] Ibid., Band ii., No. 2 et 3.

motion. It is this motion that pumps the air into the tube and through this into the tympanic cavity. If we observe the membrana tympani of a lizard, which is very much exposed in consequence of the absence of an auditory canal, we see, whenever the animal swallows, that the membrana tympani bulges outward, and just as quickly falls back again. On the human subject this same movement takes place, although it is so slight, in consequence of the membrane being tied down by the malleus, that it is not observed except in those cases where a new membrane has been formed after a perforation.

Dr. Rudinger[1] finds that the faucial orifice of the Eustachian tube in persons between the ages of seventy and eighty is much wider than in young subjects. The caliber of the canal is so great that the mucous surfaces do not come in contact. The fat is changed to a finely fibered connective tissue. He thinks that Jago's case of the patency of his own Eustachian tube, recorded in the British and Foreign Medico-Chirurgical Review, was perhaps due to a similar cause, that is, atrophy of the mucous membrane and muscles.

Petrosal Mastoid Canal.—Voltolini[2] describes a passage, which he calls the *petrosal mastoid canal*, leading from the skull cavity through the petrous portion of the temporal bone to the mastoid cells. It is of importance to the practitioner to know that this canal, although not usually mentioned in the text-books, forms a way by which dangerous morbid processes may pass from the middle ear to the brain and its membranes.

In the newly born child the superior semi-circular canal is, as it were, a gate or archway, under which there is a deep fossa, which runs outward, in the direction that the mastoid cells are afterward developed. This deep fossa, large enough to admit a large quill, is filled up by a consistent, gelatinous-like fold of dura mater. It does not lessen in size very rapidly after birth, for in a child one and a half years old it is still quite large. In adults this fossa has become a canal, which always exists and which is never closed. Its entrance is on

---

[1] Monatsschrift für Ohrenheilkunde, Band iii., No. 2.

[2] Ibid., Band ii., No. 2.

the posterior and inner surface of the pyramid on the posterior portion of the temporal bone, between the meatus auditorius internus and the entrance to the aqueductus vestibuli, and either just beneath or in the sulcus in which runs the superior petrosal sinus. It passes from here under the arch of the superior semi-circular canal, from within outward, and is lost in the mastoid cells, and on recent preparations the dura mater is generally sunken in at the entrance of the canal.

The writer then records a case where pus found its way through the petrosal mastoid canal to the brain.

Paracentesis of Membrana Tympani.—Schwartz's brochure on paracentesis of the membrana tympani—in which the final conclusion was reached that this operation was chiefly useful in acute affections, although of some service in a limited number of chronic cases—where there is a bulging outward of the membrana tympani from accumulated mucus, blood or pus, has awakened discussion on this subject. Tenotomy of the tensor tympani, exsection of the malleus, perforation by a galvano-caustic apparatus, are procedures which may be said to be on trial, but which have not as yet been fully adopted as legitimate and successful means for the relief of chronic affections of the mucous membrane and ossicula of the tympanic cavity.

James Hinton[1] publishes seven interesting cases, in which mucus had been accumulated in the cavity of the tympanum for so long a time as to bring them out of the range of acute cases, and for which he performed paracentesis, and for the most part with a very favorable result. He also states that the late Mr. Toynbee had devised a syringe for the double purpose of perforating the membrana tympani and of withdrawing the accumulated secretion.

Dr. Blake,[2] of Boston, in a report of one of Politzer's clinics, has described an eyelet of hard rubber, used by Dr. Politzer, with which to maintain a perforation of the membrana tympani. This eyelet may be obtained in this country.

---

[1] Guy's Hospital Reports, 1869.

[2] Boston Medical and Surgical Journal.

Affections of the Middle Ear.—Weber,[1] of Berlin, has introduced a new instrument for the treatment of the affections classed under the heads of chronic aural catarrh. By its use, as the inventor claims, the spray of concentrated solutions is carried into whatever portion of the cavity of the tympanum that may be desired. The great advantage of the instrument is that by its use we are able to localize the effect of an injection. The usual arguments against the idea that fluids may be injected into the middle ear are met and rebutted by the author, and he well shows the fallacy of experiments made on the dead subject, in which the aid of the muscles is necessarily dispensed with.

Dr. Weber's instrument is called the *pharmaco-koniantron.* It consists essentially of a long flexible catheter, which is inserted in one of metal. The former has a lateral opening in its beak, which may be turned in any direction desired. An india-rubber air-bag, or syringe, connected by a side piece to the catheter, is the means of sending in the fluid which becomes spray. It seems to be a modification of Bishop's nebulizer.

Schwartze,[2] in two articles, in English and German respectively, calls attention to the use of strong solutions of nitrate of silver in suppuration of the middle ear, unattended by the formation of granulations or the development of necrosis. As the Society is well aware, this treatment is by no means new, and yet it has probably never before been used with such precise indications as those laid down by Dr. Schwartze. Solutions of nitrate of silver of a strength of from xx. ad xl. gr. ad ℥i. aq. destillat are poured into the ear, and are repeated daily, *pro re nata.* A solution of salt is immediately used after the instillation, in order to neutralize the silver.

Dr. Schwartze[3] relates a case of hemorrhage into the cavity of the tympanum in Bright's disease. The patient also suffered from retinal hemorrhages. The first aural symptom was pain. The membrana tympani was of a bluish-red color; on the next day it was of a dark red. The membrane became perforated

---

[1] Monatsschrift, Jahrgang ii., No. 4.

[2] Archiv für Ohrenheilkunde, iv. Band, i. Heft. London Medical Times and Gazette.

[3] Archiv für O., Bd. iv., No. 1.

and the blood coagulum escaped. The patient died. Post-mortem showed great hypertrophy and dilatation of the left ventricle, atrophied kidneys, retinitis apoplectica, with detachment of the retina. Right cavity of the tympanum, hemorrhagic inflammation of the mucous membrane; cavity filled with blood and pus; mucous membrane of the tube greatly injected, but the injection decreased as the pharyngeal opening was approached.

The left ear, about which the patient did not complain, on account of his very low condition during the latter days of his life, was similarly affected—*i. e.*, there was a dark red membrana tympani, the cavity of the tympanum containing blood and serum, without inflammation of the mucous membrane. Mucous membrane of the tube injected, and most at the pharyngeal orifice. The mucous membrane of the naso-pharyngeal cavity of a dark red, with numerous small echymoses.

Dr. G. M. Smith,[1] in a paper on the etiology of Bright's disease, calls attention to the aural symptoms sometimes arising in the course of this affection in the following language:

"Deafness is sometimes developed in the course of the disease. This symptom, when transient and accompanying a lethargic condition of the patient, has been properly attributed to uræmia. The same symptom, however, in conjunction with others, may be permanent, in which case I ascribe their occurrence to a peculiar lesion of the ear; a lesion peculiar in that it holds a relationship to the nephritic disorder, and is not, so to speak, of accidental origin. * * * It would seem desirable, when treating patients affected with obscure auditory diseases, to examine their urine both chemically and microscopically."

A case occurred in the practice of your committee, which was reported in a paper read before the New York Academy of Medicine, shortly to be published,[2] where the patient suffered for a long time from aural disease, suppuration of the drum membrane and pain, until finally the general symptoms of Bright's disease set in, adding to the importance of the case

---

[1] Transactions New York Academy of Medicine, Vol. iii., Part 2.

[2] New York Medical Journal, Vol. ix., No. 5.

reported by Schwartze and the suggestion made to us by Dr. Smith.

Dr. Lucae[1] writes on occlusion of the nasal passages from catarrhal inflammation, which, as he says, places the cavity of the tympanum in the condition of that of a person practicing Toynbee's method of inflation. A form of impaired hearing comes from this cause, which is relieved by securing a free opening of the nostrils.

Otitis Neonatorum.—Your committee may perhaps assume that every practitioner who has seen much of aural disease has met with cases the history of which plainly showed that the subject, a little child, had suffered from otitis long before this affection was diagnosticated. Voltolini's first paper on inflammation of the membranous labyrinth erroneously supposed to be cerebo-spinal meningitis, has called out many verifications of this point, and it has done a great service in putting the practitioner on his guard as to the origin of a disease which, if it does not lead to death, places the patient in a condition of burial from the world of sound. Dr. Voltolini has continued his observations on this subject in various numbers of the Monatsschrift für Ohrenheilkunde.

Wreden,[2] following in the footsteps of Von Tröltsch, has reinvestigated the subject of infantile aural catarrh, by examining a number of dead bodies of infants taken from a foundling institute. The existence of the mucous cushion in the cavity of the tympanum discovered by Tröltsch is verified, but it is found that it is absorbed in forty-eight hours after birth. Inasmuch as quite a full synopsis of Dr. Wreden's article appears in the American translation of Tröltsch,[3] no further quotations are made from this very valuable paper.

Voluntary Contraction of the Tensor Tympani Muscle.—Politzer,[4] after some remarks on the various theories as to the action of the tensor tympani, writes that he has satisfied himself that on the contraction of the muscle the handle of the

---

[1] Monatsschrift für Ohrenheilkunde, Bd. iii., No. 2.

[2] Ibid., Jahrgang ii., No. 8.

[3] Diseases of the Ear, second edition, p. 408.

[4] Archiv für Ohrenheilkunde, iv. Bd., i. Heft.

malleus is pressed inward, while the head, with a part of the neck, is pushed outward, and that at the same time the whole malleus with its movable axis is drawn inward. He did not observe any relaxation of the anterior portion of the membrana tympani on making traction on the tensor, but on drawing upon the belly of the muscle a tension of all the parts of the membrane was observed. Politzer then records the case of Dr. A., who communicated to him the fact that for a year he had been annoyed by the occasional involuntary occurrence of the contraction of the tensor tympani. For two or three years the patient had suffered from a slight rumbling noise in his ears—sometimes in one, sometimes in the other—which lasted for hours, and sometimes for days, occurring especially when he was actively engaged in intellectual employments. Independent of this symptom, Dr. A. experienced in the depth of his ears a short and quick motion or muscular contraction, not dependent upon the will, which lasted for several seconds, and which returned at irregular intervals. These contractions were very rapid, and compared by the patient to the stroke of of a hammer making twenty excursions in the second. He was able to excite these contractions at any time, either in one ear or the other, but then the motions were not so quick, and after five or six seconds they could not be produced, because a sensation of fatigue in the ear occurred, which disappeared in from half a minute to a minute, when the contractions could again be produced. A noise in the ears occurred during the contractions and a sensation of deafness, which was relieved as soon as the contractions ceased.

On examining the membrana tympani during these contractions, a sudden inward motion of the lower end of the handle of the malleus was observed, and a lessening in size of the triangular light spot. During the voluntary contraction the uvula was pushed forward. This movement was involuntary, and yet that of the tensor tympani and uvula could be made independently of each other. Respiratory movements had no influence upon the contractions. The hearing distance was greatly diminished, as tested by the watch during the contractions. When the watch was placed between the teeth it sounded much louder, as did a tuning fork placed on the fore-

head. The deep tones of a flute were heard indistinctly when the contraction lasted for any time. Such a change was not observed in the high notes. Similar results in the perception of tones were obtained on the piano. The deep tones were indistinct, the middle ones somewhat heavier and higher, while in the high tones the distinctness was unaltered, but during the contraction it was about a fourth of a tone higher.

Ossicula Auditus.—Professor Henke[1] has contributed to our knowledge of the mechanism of the *ossicula auditus*. According to the views of previous investigators, the base of the stapes has a to and fro or sort of rocking motion on the fenestra ovalis; since it was believed that the ossiculum lenticulare or os orbiculare moved in the direction of the crura of the stapes. According to Henke there is a swinging motion around a horizontal axis situated in the base of the stapes. The object of such a movement is to render possible an extensive change in position of the membrana tympani, and also to reduce that of the stapes to a minimum—to one of a very undisturbing variety—so that the peculiar vibrating movements may radiate into the fluid of the labyrinth through the ossicula.

The distinguished inventor of the ophthalmoscope, Helmholtz,[2] has added to the debt due him for his scientific investigations by a contribution to our knowledge of the mechanism of the ossicula auditus, which should find a translator into our tongue, but which will not admit of a condensation suitable for this report.

Otological Congress.—The first Otological Congress ever assembled met at Dresden on September 20, 21, 22, 23 and 24, 1868. Dr. Schwartze presided, and delegates were present from Great Britain, Germany, and one from the United States. The session seems to have been an informal one, and hence no papers especially prepared for the occasion were read.

The subject of sea-bathing in aural disease was the first subject discussed. Dr. Magnus considered the fear of such bath-

---

[1] Monatsschrift für O., Bd. ii., No. 6.

[2] Die Mechanik der Gehörknochelchen, Bonn, 1869.

ing on account of aural disease to be unnecessary. Schwartze, Jones, Hinton, Lucae and others, however, considered sea-bathing as very dangerous to the ears, both from the entrance of the water and the mechanical force of the waves upon the ear.

The experience of the Society will be valuable on this point. I have seen very many cases of aural inflammation directly traceable to bathing with exposed ears.

The use of bougies in the Eustachian tube was also discussed. Drs. Schwartze, Wendt and Lucae did not think that narrowing of the tube was as frequent as stated by Kramer. Schwartze would use the bougie as a diagnostic means when the repeated use of the air-bath produced no result on auscultation.

Two cases of breaking of laminaria bougies in the tube were reported. Guye, of Amsterdam, used bougies in about fifty per cent. of the cases of catarrh of the middle ear, while Schwartze and Lucae found them seldom necessary.

Anderson, of Glasgow, thought bougies were used too often on the Continent and too seldom in England. They should be used as in the urethra, either to remove stricture or to stimulate the mucous membrane.

Paracentesis of the membrana tympani was also discussed, but no new facts other than those in Schwartze's paper were presented.

Parasitic growths in the ear and the treatment of simple non-purulent catarrh of the middle ear were also discussed.

Pagenstecher's nomenclature was adopted as the basis for discussion. 1. Hypersecretion; 2. Vascular ectasia; 3. Sclerosis.

In the first named form, the use of the catheter, with air, vapor of the muriate ammonia and injections, Politzer's method, internal use of quinine, iodide of potassium and iron, rubbing the skin, treatment of the naso-pharyngeal membrane by gargles and injections, paracentesis of the membrana tympani, were the remedies spoken of.

In the second form no irritants should be used. The internal use of acids and the application of the artificial leech were advised.

In the third form the injection of irritants was advised.

Lucae had used atropine poured into the ear with benefit in some cases (gr. ij. ad ʒi.), as far as diminishing tinnitus was concerned.

Obturation of the canal, as suggested by Politzer, had been practiced; but one delegate, Hinton, had seen any benefit from the procedure.

The Congress adjourned to meet at Innspruck at the forty-third meeting of the German Naturforscher und Aertze, when the following subjects will be discussed:

1. Treatment of chronic suppurative catarrh of the middle ear.

2. Diagnosis and treatment of the diseases of the aural nervous system.

3. The influence of quinine on the ear.

It will thus be seen that our organization antedates that of our brethren across the sea, although we have not entered upon our discussions until this year.

(2.) A paper by Dr. Wm. W. Morland, of Boston (read by the Secretary), on Deafness in connection with Pregnancy and the Puerperal Condition.

Deafness in Connection with Pregnancy and the Puerperal Condition. By Wm. W. Morland, M. D., of Boston.

Mrs. K., 38 years old, a stout, healthy looking woman, of strumous diathesis, although not very marked, consulted me some time since in relation to a deafness, which—with certain remissions, to be specified—had continued for thirteen years.

It first came on immediately after her first miscarriage, thirteen years since. She has since miscarried five times. On several of these occasions she flowed dangerously. The miscarriages have been at various periods, from six weeks to six months.

During her pregnancy she always hears perfectly—sometimes, indeed, *too acutely*. Immediately after miscarriage or delivery, the hearing is again almost completely lost. During menstrual periods she is more deaf than at other times. For the last four years she has grown much more deaf.

A noteworthy fact is that she had a sister affected in very much the same manner. Immediately after confinement with a child, at full term, she entirely lost her hearing. When the child was nine months old the mother died, so that no opportunity was afforded for observing whether the alternation of the presence and absence of the sense of hearing would occur, as in the patient's case. It is presumable, however, that it would have so occurred.

The ears, in this patient, are almost wholly normal. There was slight redness of the meatus observed, but nothing of consequence. The membrana tympani healthy in both ears. The bodily functions were all well performed. There was no headache.

The phenomena are interesting in themselves, and seemingly mainly dependent upon the different states of the circulation existing during the pregnant condition, at the miscarriages and at parturition. The nervous power was, of course, greatly affected by the above conditions; yet we hardly need resort to the undesirable and too often meaningless term "nervous deafness" to explain the circumstances. Anæmic deafness would, perhaps, be a more proper designation; yet the phenomena occurred several times when there had been no more than the ordinary loss of blood in labor.

Similar cases are noticed by standard authorities, although not precisely the same. The fact of the alternation mentioned, from *almost total* loss of hearing to recovery of the *full power* of the sense, is not, so far as I have been able to examine authorities, noted.

Tröltsch, it is true, refers to that "temporary deafness, which Von Scanzoni several times observed, after the application of leeches to the vagina, usually connected with a general vascular excitement and with the eruption of *urticaria* over the whole body."[1] He goes on to mention the "peculiar vacillations in the power of hearing" experienced by chlorotic and hysterical patients, and, noticing "the negative appearances" in the ears themselves, remarks upon the "singular sympathy"

---

[1] Treatise on the Diseases of the Ear, etc. Translation by D. B. St. J. Roosa, M. D. Second Amer. edition, p. 499.

of the above phenomena "with the general health and the sexual functions," as justifying the appellation "nervous." Such are analogous cases with the one presented, but not identical.

Wilde, under the head of "Nervous Deafness," says: "Many deaf persons trace back the first accession of disease to grief, affliction, sudden mental emotion; to a shock, or to some great calamity. In many cases it first appears after child-birth, but it ordinarily comes on between twenty and thirty-five years of age." He notices the fact that both ears, sooner or later, become involved, but that the patient "almost always hears better on one side than the other." My own patient's left ear was the best. Toynbee, also, treating of "Nervous Deafness," says: "Patients have become totally deaf after the administration of too violent a purgative, or after an attack of diarrhœa or cholera, and after the nervous exhaustion attendant upon child-birth; in some instances of the latter, the deafness has begun with the birth of the first child and increased with each successive birth, until at last the nervous power was wholly lost."

I have not, moreover, seen reports of such phenomena occurring after miscarriage—only at the full term of pregnancy.

I have personally observed only one other case in which deafness was associated with the puerperal state. It occurred about six years ago, the deafness coming on immediately after the first confinement. Visible aural apparatus, healthy. Woman rather delicate, and occasionally has what she terms "rush of blood to the head," with flushing of the face. There is tinnitus aurium—sometimes a loud sound, as of working machinery, at others a sound as of waves on a beach. Both sounds disappear, or are unnoticed when in the crowded streets of a city, but become very annoying when she is much fatigued.

No other treatment was advised in these cases except general hygienic care, with tonics.

Dr. Dix remarked that he had observed cases where deafness occurred first at parturition and increased at each subsequent pregnancy.

Dr. Roosa and Dr. Weir had seen such cases, but the patients showed evidences of aural catarrh, and it was probable

that they were cases of aural catarrh increased by the puerperal state.

Dr. Knapp thought that there may be cases of deafness after parturition caused by anæmia, and analogous to anæmic amblyopia under like conditions.

(3.) A case of Acute Purulent Aural Catarrh, induced by the use of the Nasal Douche, was reported by Dr. Knapp.

A Case of Purulent Otitis Media caused by the Nasal Douche, and showing the Symptom of Double Hearing with both Ears. By H. Knapp, of New York.

The use of Weber's nasal douche for diseases of the naso-pharyngeal region has become pretty extensive. Only of late some observations came to my notice which show that there is a good deal of danger in this practice. Dr. D. B. St. John Roosa describes, in the Archives of Ophthalmology and Otology, I., 1, p. 259, etc., a case in which the origin of a purulent inflammation of the middle ear, of the very severest kind, could be traced to the use of the nasal douche. He adds that he saw, on two previous occasions, its employment causing considerable trouble in the ear, with rupture of the drum-head. He had seen few cases where the use of the douche could be tolerated for any length of time. Dr. S. Moos, of Heidelberg, in a note to the German translation of Dr. Roosa's paper, confirms the views of the latter author, by stating that he saw the fluid, injected into the nostril by Weber's douche, flow out of the ears in two cases of perforation of the membrana tympani. Although the application of the douche is not hurtful in such cases, they prove that water may penetrate through the tubes into the tympanic cavity. In one instance, Moos saw also a catarrhal inflammation of the middle ear arising from the employment of the douche.

The practical importance of these observations induces me to communicate to you the following case of a similar nature.

A merchant of New York, 32 years of age, was in the habit of injecting, by Weber's douche, warm water into his nose for chronic catarrh. He once took cold water, and felt, immediately after the injection, considerable pain in both ears, dis-

appearing, however, very soon. After that time he used warm water for six months without any unpleasant symptoms. Then he employed cold water again and experienced at once, in his left ear, a severe pain, which soon abated, but continued to be dull and annoying for a fortnight. Then suddenly it increased, was combined with headache, throbbing in the ear, loss of appetite, and deafness. Three days afterward an abundant purulent discharge from the left ear set in. He came to my office presenting all the symptoms of a very severe otitis media with perforation of the membrana tympani. He was under my treatment from the 6th of March until the 11th of April. Three weeks after his first presentation a great improvement had been obtained, the discharge was stopped, and the drumhead closed for four days. Then an exacerbation and a new perforation occurred. The discharge kept flowing for a fortnight, when again an improvement was obtained, and the patient left New York to complete his recovery under the care of his father, a physician in the neighborhood of Philadelphia.

Besides its origin this case was remarkable for an accompanying symptom, not much known yet, viz., *double hearing with both ears.* Tröltsch and Politzer mention its occurrence only with two lines; Moos records, in his *Klinik der Ohrenkrankheiten*, p. 319, what is known on it. He observed it twice, once in a patient suffering from acute aural catarrh, who heard simultaneously the third of each tone he was singing. The disease was very soon completely cured. The second patient suffered from impairment of hearing in consequence of chronic aural catarrh for ten years. One evening, to shorten a fit of his habitual asthma, he anesthetized himself by chloroform. On awaking, his deafness was very much worse, and he heard all sounds of the upper three octaves double. His hearing power diminished further until all musical sounds appeared to him perverse, and music in general, which he had liked passionately before, became a perfect horror to him. It is not stated in either case which ear perceived correctly the natural tone, nor whether the pseudo-tone was higher or lower in pitch.

The only well analyzed case of the few of double hearing on record is that of Prof. Von Wittich, on himself. The excellent physiologist of Königsberg observed, four weeks after

a severe acute purulent otitis, that he heard all tones of the middle octave of a piano *half a note higher* with the diseased ear than with the healthy one. His explanation is that exudation in the tympanic cavity had, by altering the pressure of the fluid in the labyrinth, changed the tuning of the terminal filaments of the auditory nerve.

When I examined the patient, whose history I have spoken of, three days after the discharge had set in, I found, in the diseased ear, the hearing power for noises very much diminished (watch of 6′ hearing distance heard from $\frac{1}{2}''$), whilst musical sounds were nearly as well perceived as in the normal state. A large tuning-fork, placed on the glabella, was heard *double*, namely, in the diseased ear more strongly and about two tones higher than in the sound ear. On trial with a piano I verified the same anomaly to exist for the middle and higher octaves, whilst it was not observed in the lower octaves. There was no distinct limit between single and double hearing. This phenomenon existed unchanged during the first week, when the perforation was well marked and the discharge abundant. Then both the sounds gradually differed less in pitch, until, three weeks later, they hardly differed by half a note. After the relapse, the double hearing still existed, but was no longer so marked as before.

The main difference between this case and that of Prof. Wittich is, *that in the latter the pseudo-tone of the diseased ear was higher, in the former it was lower.* The same disease had brought about in both cases a false tuning in Corti's organ. If we compare the latter with a stringed instrument, then the false tuning must have been caused in one case (Wittich's) by relaxing, in the other one by tightening the strings. Let us suppose, for example, that a string (or Corti's arc) which, in the normal condition, were so tuned as to perform three hundred vibrations per second, were now so much more tightened as to perform three hundred and fifty per second. If, then, a musical instrument—for instance, a tuning-fork—yielding three hundred and fifty vibrations per second, were sounded strongly enough to be perceived simultaneously by both ears, it would excite sympathetic undulations in that string (Corti's arc or fibre) of either ear which is so tuned as to

yield three hundred and fifty vibrations per second. In the healthy ear this would excite a nervous fibre which always conveyed to the brain the impression of three hundred and fifty vibrations per second; but in the diseased ear it would irritate a nervous fibre which always conveyed to the brain the impression of three hundred vibrations per second. Therefore two tones are perceived, and that of the diseased ear is the lower one.

I suppose this symptom, which, in analogy to diplopia, may best be termed *diplacusis binauricularis*, will be more frequently observed than has been the case hitherto, if our attention be turned to it. It may not only be of physiological interest, but guide our prognosis and treatment by demonstrating that, in the respective cases, the *labyrinth* is either primarily affected or participates in some other disease.

(4.) A paper was presented on Parasitic Growths in the External Auditory Meatus, by Dr. J. Orne Green.

Two Cases of Parasitic Growth (Aspergillus Glaucus) in the External Auditory Meatus. By J. Orne Green, M.D., of Boston.

The two specimens here shown are parasitic growths removed from the external auditory meatus. The case of the patient from whom the first was taken was reported in full in the Boston Medical and Surgical Journal of Nov. 19, 1868. The parasite had caused a marked increase in the subjective symptoms, and the deafness depending on a chronic simple inflammation of the tympanum; neither the history nor the examination revealed any previous suppuration.

The second case has never been published, and offers some points of interest, as I was myself the subject of the disease. Several times during my life I have suffered from furuncles in the meatus, the last time nearly two years before this trouble. I was treating the first case during the months of June and July, 1868, and was at the time perfect in health and ears.

In August I felt some ill defined irritation in the ears, attended by a slight serous discharge, just enough to be felt with the fingers; this, however, soon ceased without any treatment,

and was only recalled to mind on a return of the trouble in the next November, when I noticed in both ears the same slight serous discharge, with prickling, itching and occasional slight pain and feeling of fullness in the ears. The hearing was found by the watch to be somewhat impaired. Dr. E. H. Clarke, who kindly examined them, reported that each meatus showed patches of deep congestion and small white masses, which were pronounced from their appearance epidermis. A mild astringent instillation and syringing was used for a few days, when, not obtaining relief, I examined microscopically some of the small white flakes, which in gross appearance resembled epidermis, and found the parasite. An instillation of acid carbolic, gtt. v. ad ʒij., was then substituted, and the ears syringed daily for a week; but each syringing continued to bring away flakes of the parasite, and I changed to a solution of carbonate of soda, without, however, checking the growth. Every day small flakes would be syringed out, and the microscope showed that they contained great numbers of the fructifying heads of the aspergillus in early stages of development. A solution of calcaria hypochlorosa, gr. ij. ad ℥j., was then used, as recommended by Wreden, and the daily syringing continued. The sporangia became gradually less numerous, of a smaller size and earlier stage of development, and the epidermal cells mixed with them increased in number. After some six weeks of treatment the syringe ceased to bring away any thing, and the ears became normal in feeling and function, and have so remained.

It would be presumptuous to draw any general conclusions in regard to treatment from these two cases; but in my own case I am inclined to ascribe much more to the continued syringing than to the medicaments used. After their use the changes in the mycelium and sporangium described by Wreden certainly were not apparent, so that the only effect they could have had was to loosen the masses from the meatus, and the force of the syringe seems much more likely to have done this.

The subjective effect of the instillations was various: the carbolic acid solution was irritating, producing a feeling of warmth in the ear which in a few minutes increased to smart-

ing, burning and vertigo, which lasted for some ten minutes after the ear was dried. The effect of the carbonate of soda was not specially noted, but was indifferent. The hypochlorite of lime was very pleasant, seeming to soothe the irritation without producing any disagreeable symptoms; and if, as Wreden claims, it acts more powerfully than any other agent on the parasite, its mildness is an additional indication for its use.

The symptoms in my own case, showing themselves so soon after I had treated the first and only case I have seen, would seem to show that I had in some way transferred some of the spores, and that these subsequently developed; but how this was done I am unable to say. That they were transferred by the otoscope was impossible, for the end used by myself is of a different color from that used by the patient, and I am always very particular to preserve the distinction; but the spores having once obtained a resting place in one ear they could easily have been transferred to the other by this instrument, as I use it indifferently in the two ears. What particular condition favored their development after lodging in the meatus cannot be determined. I was not aware previously that the ears varied from the normal condition.

In the first case the parasitic growth had formed a thin, dark colored membrane, which covered the deeper parts of the meatus and membrana tympani, and after removal showed a perfect cast of these parts. The microscope showed a vast number of the sporangia of the aspergillus, of large size and of a slight yellow color, mixed with the stalks of the mycelium, which formed the body of the membrane. In my own case the growth had not reached such a degree of development; the pieces removed were all small, none larger than one-third of an inch square, all but one or two of a white color, and the sporangia not more than one-fourth the size of those in the first case. Nothing like a cast of any part of the meatus was discovered.

Wreden's articles are no doubt familiar to most of the members of the Society. The first appeared in the Archiv für Ohrenheilkunde, Vol. iii., and a synopsis of this is given in the Boston Medical and Surgical Journal above referred to. In the second, which appeared some months after in a pamphlet

form (Die Myringomykosis Aspergillina und ihre Bedeutung für das Gehörorgan), additional cases with remarks and experiments are given.

Wreden experimented by placing portions of the growth in solutions of medicaments considered destructive to parasites, and found, from eighteen different solutions, that those having the most destructive action on the aspergillus were the liquor calcis chloratæ and a solution of chlorinated lime (chemically pure), two grains to the ounce. From these experiments he concludes that the solutions of the subchlorides are the most destructive, and particularly recommends the chlorinated lime of the above strength, on account of its energetic action on the parasite and the slight irritation it produces in the meatus. The only caution he gives is to dissolve the salt fresh at each application, in order to obtain the benefit of the chemical action which is immediately set up, and by which chlorine and oxygen are set free, and the latter in *statu nascenti* (ozone) possesses the greatest oxidizing, *i. e.*, destructive property.

The portions of aspergillus submitted to the action of such a solution for six hours Wreden describes as converted into a homogeneous, amorphous mass, in which no sign of mycelium, sporangium or sporule was to be discovered.

The following addition to the By-Laws was made:

"An Executive Committee of three (3) shall be appointed by the Chair at each annual meeting, to nominate officers of the Society and the other committees, and to present an order of business."

Section 2 of the By-Laws was so amended that the officers of the Society shall consist of a Vice-President, in addition to the other officers mentioned.

On motion of Dr. John Green it was

Resolved, 1. That the By-Laws be so far suspended as to give to the Publishing Committee discretion to publish the Transactions of the present year in connection with the Transactions of the American Ophthalmological Society.

2. That all papers referred to the Publishing Committee be furnished to the Committee before September 1st.

3. That proofs be sent to the authors, and that they be returnable within one week of the date of their receipt; if not returned within

that time the paper may be left out, at the discretion of the Publishing Committee.

A tax of one dollar was assessed on each member.

The following subject was chosen for discussion next year, viz., Simple Chronic Inflammation of the Tympanum.

The following committees were appointed and officers elected for the ensuing year, viz.:

COMMITTEE ON PUBLICATION:

Dr. C. E. HACKLEY.
" R. F. WEIR.

COMMITTEE ON PROGRESS OF OTOLOGY:

Dr. J. ORNE GREEN.

OFFICERS FOR 1869-70:

President ..... Dr. H. D. NOYES.
Vice-President ..... " E. L. HOLMES.
Rec. Secretary and Treas. ..... " C. E. RIDER.
Cor. Secretary ..... " H. L. SHAW.

The Society then adjourned to meet at the Atlantic Hotel, Newport, R. I., on Wednesday, July 22d, 1870.

TRANSACTIONS

OF THE

American Otological Society.

THIRD ANNUAL MEETING.

NEWPORT, R. I., JULY 20, 1870.

NEW YORK:
D. APPLETON & COMPANY,
90, 92 & 94 GRAND STREET.
1870.

MEMBERS OF THE AMERICAN OTOLOGICAL SOCIETY.

Dr. Frank W. Abbott.....Buffalo, N. Y.
Dr. C. R. Agnew.....New York City.
Dr. C. J. Blake.....Boston, Mass.
Dr. A. H. Buck.....New York City.
Dr. John H. Dix.....Boston, Mass.
Dr. Samuel L. Frank.....Baltimore, Md.
Dr. J. Orne Green.....Boston, Mass.
Dr. John Green.....St. Louis, Mo.
Dr. Charles E. Hackley.....New York City.
Dr. J. H. Hinton.....New York City.
Dr. E. L. Holmes.....Chicago, Ill.
Dr. H. Knapp.....New York City.
Dr. J. W. Lawton.....Syracuse, N. Y.
Dr. W. J. Ludlum.....New York City.
Dr. Arthur Mathewson.....Brooklyn, N. Y.
Dr. W. W. Morland.....Boston, Mass.
Dr. H. G. Newton.....Brooklyn, N. Y.
Dr. H. D. Noyes.....New York City.
Dr. J. F. Noyes.....Detroit, Mich.
Dr. Chas. J. Pardee.....New York City.
Dr. Howard Pinkney.....New York City.
Dr. Thos. R. Pooley.....New York City.
Dr. J. S. Prout.....Brooklyn, N. Y.
Dr. O. D. Pomeroy.....New York City.
Dr. C. E. Rider.....Rochester, N. Y.
Dr. C. A. Robertson.....Albany, N. Y.
Dr. D. B. St. J. Roosa.....New York City.
Dr. W. W. Seeley.....Cincinnati, O.
Dr. H. L. Shaw.....Boston, Mass.
Dr. Francis Simrock.....New York City.
Dr. H. N. Spencer.....St. Louis, Mo.
Dr. R. F. Weir.....New York City.
Dr. A. D. Williams.....Cincinnati, O.
Dr. E. Williams.....Cincinnati, O.

MINUTES OF THE AMERICAN OTOLOGICAL SOCIETY, FOR 1870.

The Third Annual Meeting of the American Otological Society was held at the Ocean House, Newport, R. I., on Wednesday, July 20th, at 10½ A. M.

The following members were present: Dr. J. Orne Green, Boston, Mass.; Dr. C. J. Blake, Boston, Mass.; Dr. W. W. Morland, Boston, Mass.; Dr. C. A. Robertson, Albany, N. Y.; Dr. H. D. Noyes, New York, N. Y.; Dr. D. B. St. John Roosa, New York, N. Y.; Dr. H. Knapp, New York, N. Y.; Dr. R. F. Weir, New York, N. Y.; Dr. C. R. Agnew, New York, N. Y.; Dr. John Green, St. Louis, Mo.

The Society was called to order by the President, Dr. H. D. Noyes, and in the absence of Dr. Rider, the Secretary, Dr. Weir was appointed Secretary, *pro tem.* The minutes of the last meeting were read and approved.

The President appointed Drs. Agnew, Roosa, and J. Orne Green, as the Executive Committee to nominate officers, committees, and to arrange an order of business.

This Committee reported the following named as a Committee on Nomination of New Members: Drs. Noyes, J. Orne Green, Weir, Roosa, and Blake, who recommended the names of the following gentlemen for election, and on ballot they were duly elected: Drs. T. R. Pooley, C. J. Pardee, J. H. Hinton, H. Pinkney, and A. Buck, of New York City, and Dr. H. Spencer, of St. Louis, Mo.

Drs. Buck and Pooley thereupon took their seats as members of the Society.

The Treasurer's report was then presented, and referred to the Auditing Committee, Dr. Blake.

The following gentlemen were invited to seats at the meeting, and to take part in the proceedings: Dr. F. Delafield, New York; Dr. G. A. Peters, New York; Dr. W. Thomson, Philadelphia; Dr. Norris, Philadelphia.

The resignation of Dr. F. J. Bumstead was read and accepted.

Pursuant to the order of business presented by the Executive Committee, the following papers were read to the Society, and subsequently referred to the Publishing Committee:

1. Report on the Progress of Otology for 1869–'70. By J. Orne Green, M. D., of Boston.
2. Ingrowing Hairs from the Tragus, resting upon the Membrana Tympani. By Robert F. Weir, M. D.
3. Complete Cutaneous Occlusion of the Left Meatus Auditorius Externus, with Hyperostosis of the Osseous Portion. By William W. Morland, M. D., of Boston.
4. A Case of Malignant Diseases of the Ear. By C. A. Robertson, M. D., of Albany.
5. The Mastoid Process in Inflammatory Affections of the Middle Ear. By D. B. St. John Roosa, M. D., of New York.
6. Sinus through the Mastoid, from old Suppurative Otitis Media; and Trephining. By C. R. Agnew, M. D., of New York.
7. Otitis Media, following the Use of a Bougie in Eustachian Tube; Introduction of an Eyelet into Membrana Tympani; Results. By Henry D. Noyes, M. D., of New York.
8. A Case of Epithelioma of the Auricle and Meatus. By J. Orne Green, M. D., of Boston.
9. Foreign Bodies in the Ear; Importance of a Correct Diagnosis; Methods of Removal; Cases. By William W. Morland, M. D., of Boston.
10. A Case of Polypoid Angioma Cavernosum situated in the External Auditory Canal, and originating by a Slender Pedicle in the Manubrium Mallei. Reported by Albert H. Buck, M. D., Assistant Aural Surgeon to the New York Eye and Ear Infirmary.
11. Case of Aspergillus in the External Auditory Meatus. By John Green, M. D., of St. Louis, Mo.

12. Form of the Eustachian Catheter, especially when introduced by the Opposite Nostril. By Henry D. Noyes, M. D., of New York.
13. Congenital One-sided Bony Closure of the External Auditory Canal, with Rudimentary Development of the Auricle. By F. Knapp, M. D., of New York.
14. Hemiplegia occurring in Coincidence with Chronic Suppuration of the Middle Ear. By D. B. St. John Roosa, M. D., of New York.
15. Ununited Fracture of the Long Process of the Malleus. By R. F. Weir, M. D., Surgeon New York Eye and Ear Infirmary.
16. Observations on the Use of Steam in the Treatment of Diseases of the Middle Ear. By Charles Inslee Pardee, M. D., of New York.
17. Observations upon the Physiology of the Eustachian Tube, made during a Short Exposure to an Atmospheric Pressure of Sixty Pounds to the Square Inch. By John Green, M. D., of St. Louis, Mo.

Dr. Weir was requested to reduce his remarks to writing, for incorporation in the published transactions of the Society.

After the report on the Progress of Otology, Dr. Agnew moved that a vote of thanks be presented Dr. Green for his excellent report. Carried.

After reading the eighth paper, the Auditing Committee read his report, which was accepted.

Notice of amendment of Section 3 of the Constitution was given, to substitute "5" for "8" as the number required for a quorum. On motion, the Society then adjourned to 7 P. M.

Adjourned Meeting at 7 P. M.

Minutes of preceding meeting read and approved.

The Committee on Nomination of New Members presented the name of Dr. A. Matthewson, of Brooklyn, N. Y., who was duly elected.

Dr. T. F. Cock, of New York City, was invited to participate in the proceedings of the Society.

The reading of the papers was then resumed.

The amendment to Section 3 of the Constitution, proposed at the last meeting, was then made, when the Society went into executive session. On returning to open session, on hearing a report of the Publication Committee, it was moved that the proceedings of the Society be published separate from those of the Ophthalmological Society, and that the Publishing Committee be authorized to make such assessment on the members of the Society as their legitimate expenses may require. Carried.

By Dr. Green it was moved that all papers referred to the Publishing Committee be sent to them before October 1st, and that proofs of articles be sent to their authors, returnable within a week after the date of their receipt, in default of which return the paper to be left out of the Transactions at the discretion of the Committee. Carried.

Dr. Roosa moved that, when the Society adjourn, it should meet again on the call of the Secretary, the day previous to the Annual Meeting of the American Ophthalmological Society. Carried.

The Executive Committee presented the following list for officers for the ensuing year, who were duly elected by the Society:

President, Dr. H. D. Noyes;
Vice-President, Dr. E. L. Holmes;
Secretary and Treasurer, J. Orne Green;
Corresponding Secretary, H. L. Shaw;
Committee on Publication, { Dr. R. F. Weir, Dr. C. E. Hackley;
Committee on Progress of Otology, Dr. A. H. Buck.

The Society then adjourned.

R. F. Weir, *Secretary, pro tem.*

REPORT ON THE PROGRESS OF OTOLOGY, FOR 1869–'70. By J. Orne Green, M. D., of Boston.

The large number of articles which have appeared during the last year in the journals of Germany, France, and America, show the still increasing interest which diseases of the ear are exciting in the minds of the profession. The result has been a great addition to our knowledge of the pathology of these diseases. While dissection of the minute parts was, till within a short time, comparatively rare, the last year has added a large number of minute and careful observations, which show us the course of disease, and suggest the appropriate treatment; and, although the result of these dissections has often demonstrated the dangerous nature of some diseases, the histories of the cases should only impress upon us the necessity of attending carefully to the earlier and less severe symptoms. Our advance in the treatment of aural disease is exactly commensurate with our advance in its pathology, and, even if no new therapeutic agents had been discovered, our increased knowledge of the nature and course of disease would enable us to use the old remedial agents in such a way as to get results hitherto impossible.

The researches in the field of physiology during the last year have been important and laborious, and, although many of them are not mentioned in the following pages, because I cannot consider them as yet perfected, the results are such that my successor will, I trust, soon be able to bring to your attention important advances in this very extensive branch of our subject.

The relations and attachments of the muscles of the Eustachian tube have been recently demonstrated very satisfac-

torily by Rüdinger.[1] The tensor-palati muscle is a dilator of the tube; it is inserted along the whole length of the hook of the cartilage, passes forward, inward, and slightly downward, and its fibres spread out along the edge of the soft palate and on the side of the pharynx. In contracting, it draws the hook of the cartilage forward and a little downward, thus enlarging the calibre of the tube. The levator palati takes its origin from the temporal bone just below the osseous tube, and passes along the floor of the tube, some of its fibres arising from the lower end of the cartilage; it is inserted in the uvula, and, in contracting the belly of the muscle which lies along the floor of the tube, becomes thicker: the floor of the tube is raised, and the fibres rising from the cartilage serve to draw the lower end of this away from the opposite wall.

The palato-pharyngeus rises from the posterior part of the lower end of the cartilage, passes backward, and is inserted on the posterior wall of the pharynx. Its action would be to draw the posterior wall of the tube backward; but, as it is often but slightly developed, it probably only serves to fix the cartilage, so that the other muscles can act more effectively.

The opening of the tube is thus the result of the action of these three muscles: the tensor palati, or dilatator tubæ, draws the hook of the cartilage outward, the cartilage becomes less curved and the tube is widened; the levator palati in contracting becomes more horizontal, and draws the lower end of the cartilage inward and upward, thus enlarging the pharyngeal orifice more than 3‴. As soon as these muscles cease acting, the elasticity of the cartilage restores the canal to its former condition.

The papillæ on the dermoid layer of the membrana tympani, first described by Popper as a normal condition, and mentioned in Dr. Roosa's report of last year, are of interest in connection with the polypoid growths which are sometimes found on the surface of the membrane, and which are undoubtedly hypertrophies of these normal papillary projections.

I myself observed the same papillæ in June, 1867, when

[1] Beiträge zur vergleichenden Anatomie und Histologie der Ohrtrompete. München, 1870.

studying the microscopic anatomy of the ear in the laboratory of Prof. Wedl, of Vienna. In thin transverse sections of the membranes taken from two different children, I found "on the dermoid layer opposite the manubrium a row of rounded projecting bodies of different sizes. In many of them an appearance like a nucleus was seen, which could be traced, on changing the focus, as a loop coming from the deeper tissue and passing up on one side of the papilla, there turning and passing down on the opposite side, to be again lost in the deeper tissue. I was unable to recognize any nervous structure, and concluded that these must be loops of capillary vessels."[1] The existence of the papillæ and capillary loops was confirmed by Prof. Wedl, and, if I am not mistaken, by Dr. Josef-Gruber also. In a number of preparations from adult membranes, I was unable to find these papillæ, but my return home, and the subsequent want of material, prevented my continuing the investigation, and the fact is mentioned here as a confirmation of the more thorough investigations of Popper.

Nasiloff[2] has described, as a new form of inflammation of the membrana tympani (myringitis villosa), a shaggy condition of the dermoid layer of that membrane, which seems to have been an inflammation and hypertrophy of these papillæ. Kessel also accepts this name, and describes[3] a condition of the membrana tympani similar to that given by Nasiloff.

Politzer[4] has demonstrated, by means of an enlarged model of the ear, that the high and low notes of tuning-forks are heard much louder when the membrana tympani is curved by drawing in the hammer, than when the membrane is a plane surface. The view of Helmholtz, that the cause of the resonant power of the membrana tympani lies in the convex curvature of the radial fibres toward the meatus externus, is only partially confirmed by Politzer, since he considers that

[1] MS. Notes, written at the time, in which the description corresponds exactly with that of Popper.

[2] Centralblatt f. d. Med. Wissensch., 1867, No. 11.

[3] Archiv für Ohrenheilkunde, vol. v., p. 250.

[4] Hauptversammlung der k. k. Gesellschaft der Aerzte in Wien. April 1, 1870.

this curvature only assists the vibratory power of the membrane, and is not the sole cause of it. Politzer's experiments also showed that for increasing the resonance of the membrane it was immaterial whether it was convex or concave in the direction of the sound. He considers that an important factor for the simultaneous reception of different notes is the variable tension of the different parts of the membrana tympani, caused by the inward curvature of the membrane.

In regard to the vibration of the ossicula, Politzer considers that they vibrate not by movement of their separate molecules, but of their whole mass. In a series of experiments in which Lissajous's method was employed, the same used by Dr. Buck, of New York, in his investigations, he arrives at the following conclusions: 1. With an equal intensity of tone affecting the membrana tympani, the intensity of the vibrations of the ossicula is less with the lower than with the higher notes; with the very high notes, however, the intensity again diminishes. 2. By speaking words into the meatus through a tube, the ossicula show as many concussions as there are syllables in the word; and the extent of the vibration is reached with the vowel of the syllable. 3. If parts of the membrana tympani have a ball of wax or a small stick lying against them, the intensity of the vibration of the ossicula is not diminished; if, however, the hammer or one of the other ossicula is thus clogged, the extent of the vibrations is much diminished. 4. While the ossicula are thus clogged, it is observed that their vibrations are relatively stronger with high than with low notes; the vibration from words is less marked than that from musical notes. These results agree with the disturbances of hearing observed from disease. Cicatrices, and calcifications on the membrana tympani, affect the hearing power less than pathological products on the ossicula, which diminish their power of vibration. 5. From artificial destruction of the membrana tympani, the vibrations of the hammer are diminished, but the insertion of an artificial membrane brought into connection with the manubrium again increases them. 6. The jingling in the ear from a strong concussion, first observed by Helmholtz, and considered by him due to the striking together of the teeth of the hammer-incus

articulation, Politzer has observed experimentally, and found to be due to the buzzing of the membrane, and of the ligaments of the ossicula, and he observed the same where the hammer and incus were firmly anchylosed by artificial means.

From laryngoscopic examination of twenty deaf-mute children, from eight to fourteen years of age, Prinz [1] arrives at the following conclusions: 1. Mobility of the muscles which open and close the larynx existed, and the power of vibration of the cords was perfect. 2. From deficient control on the part of the ear a perfect adaptation of the cords did not always follow the attempt to pronounce a vowel, but after instruction this improved. 3. In most of the cases there was a slight catarrh of the cords, referred, by Prinz, to a strain from using unnecessary force.

Meyer,[2] of Copenhagen, in a communication to the Medico-Chirurgical Society of London, calls attention to an undescribed disease of the nasal and pharyngeal mucous membrane, which, if confirmed by further observation, would seem to have an important bearing on diseases of the ear. He says that frequently, in Denmark, small polypoid growths, or, as he calls them, adenoid vegetations, are met with on the naso-pharyngeal mucous membrane. They appear under the microscope to be hypertrophies of the adenoid tissue. They are most frequently met with in scrofulous children, and the functional disturbances most frequently caused by them are deafness, abnormities in the breathing and voice, and impossibility of pronouncing the nasal consonants. The other symptoms are excessive secretion of mucus, appearance of blood in the mouth in the morning, and the feeling of contraction in the nose, as from a foreign body. The objective examination is best made by passing the forefinger quickly behind the palate, when rough, spongy, or velvety irregularities, or long soft masses, can be felt covering the septum of the nose, the choanæ, etc. The only effective means of cure is the complete removal of the growths, either by a small wire-snare, or by cauterization with solid nitrate of silver, or with the galvano-

[1] Archiv f. Heilkunde, iv., p. 413. [2] Lancet, December 4, 1870.

caustic. The free bleeding which follows the use of these agents is best checked by the nasal douche.

In 1867, Politzer[1] called attention to the appearances seen on examination when serous fluid was present in the tympanic cavity. Since that time this disease has been more carefully studied, and within the last year two authors, Politzer[2] and Zaufal,[3] have given very full descriptions of the disease and its treatment. Zaufal, from a consideration of the peculiarities of the membrane lining the tympanic cavity, raises the question whether this membrane is not rather a serous than a mucous membrane, the mucous membrane of the pharynx and Eustachian tube becoming a serous membrane in the tympanic cavity, just as the mucous membrane of the uterus becomes serous in passing through the Fallopian tubes. He supports this theory from the fact of the existence in the ear of transparent bands and folds, such as are found in serous but not in mucous membranes; from the normal secretion of the membrane, which is serous, he says; from the absence of mucous glands; and from the ciliary pavement epithelium, such as is found only in the fourth ventricle of the brain. The occasional presence of the so-called mucous corpuscles in the tympanic cavity is due to the throwing off of connective tissue and young epithelial cells from inflammation. Zaufal would recognize three forms of otitis media, serosa, catarrhalis, and purulenta, all of which may be acute or chronic. The first and lowest form of inflammation leads to the secretion of clear serum; an increase in the inflammation causes a hyperproduction of the cell-elements resembling mucus-corpuscles; while a still more intense inflammation leads to a still greater hyperproduction of cells or a real purulent product. All the forms are thus different stages of one and the same process; each may appear independently, but more usually they are intermingled. Until the question of inflammation and the source of the pus-corpuscles has been more satisfactorily settled than at present, these views of otitis must be considered theoretical; the occurrence of serum in the middle ear, however, admits of no doubt, hav-

[1] Wiener Med. Wochenschrift, 1867. Wiener Med. Presse, 1869.
Archiv für Ohrenheilkunde, vol v

ing been observed, *post mortem* and during life, by many observers.

One objective appearance on which Zaufal lays great stress is a depression of the pars flaccida Shrapneli over the small process of the hammer; this, he says, he has found in his dissections a constant accompaniment of spurious anchylosis of the hammer-incus articulation, caused by tense abnormal bands around the joint, and he considers this appearance pathognomonic of such an anchylosis.

The following condensed account of the disease is from the above-mentioned authors, but the original articles are worthy of careful study. The disease is caused either from a closure of the Eustachian tube or the extension of an inflammation of that tube to the tympanic cavity. The appearances, on examination, are variable; the membrana tympani, in cases of closure of the Eustachian tube, is much drawn inward, in other cases in normal position, and occasionally is bulging into the meatus. The first is, however, the most usual condition. The surface of the fluid, when it lies on the floor of the cavity, is seen as a dark line across the membrana tympani, which alters its position as the fluid moves. If the fluid fills the cavity, this line is wanting, and the presence of the serum is recognized by its color. Occasionally the fluid catches in the upper part of the cavity, and appears on the membrana tympani, as it were, in drops. The color of the exudation is either light yellow or reddish. The patients complain of a feeling of closure of the ear, and occasionally of a movement there as of a foreign body, and sometimes of subjective noises. The deafness stands in no relation to the amount of the fluid, but rather depends on its position. The tuning-fork on the head is best heard in the affected ear. The secretion is sometimes spontaneously resorbed, especially in the more acute cases; it may, however, lead to a plastic inflammation of any degree, and the danger of this is greater the longer the duration of the disease. The indications for treatment are the early removal of the secretion and the prevention of its reformation by removing its causes, if such can be found. To remove the secretion, Politzer has modified his method of inflation by directing the patient to hold the head forward and inclined to the oppo-

site side, in order that the fluid may more easily run out through the Eustachian tube, or else he directs him to lie flat on the back during the operation, in order that the fluid may be driven into the mastoid cells. If these methods do not clear the ear, catheterization and the injection of medicaments must be tried.

In some cases, however, the serum is so adhesive that it is necessary to perform paracentesis, and follow this by the air-douche, in order to free the ear.

Lucae[1] has added to our knowledge of the pathological changes of the ear in cerebro-spinal meningitis, by the minute dissection and microscopic examination of the ears in a case which died within thirty-six hours after the beginning of the disease. The hemispheres, base, pons, and medulla, showed a marked purulent inflammation of the pia mater. By the microscope the purulent inflammation of the base of the brain could be followed along the vessels of the acoustic nerves to the cochleæ. The utricles, ampullæ, and canals of the membranous labyrinth, showed purulent inflammation; along their vessels were masses of pus-cells and free blood-corpuscles; the vessels themselves intensely congested and much thickened; the semicircular canals also showed occasional ecchymoses. The tympanic cavities, except a slight injection, were normal. The condition of the ears was nearly the same as that found in the two cases described by Heller,[2] except that Heller found also a purulent inflammation of the middle ears. Lucae considers that the injection of the tympanic cavities in his case was the beginning of such an inflammation, which was checked by the early death of the patient. The result of the examination of the inner ears showed a genuine inflammation of those parts, and not a simple penetration of the purulent matter from the brain, although Lucae considers it more probable that the inflammation of the brain began first and then set up the inflammation in the ears, than that both began simultaneously.

Having previously heard well, it was found, when the patient entered the hospital, a few hours after the beginning of the disease, that he was then exceedingly deaf, a symptom re-

[1] Archiv für Ohrenheilkunde, vol. v.

[2] Deutsches Archiv für Klinische Medicin, 1867, vol. iii., p. 5.

ferred by Lucae to the acute purulent inflammation of the internal ears.

Zaufal[1] found a purulent inflammation of both ears, with perforation of both membranæ, in a new-born child, with congenital syphilis. Both perforations were below the manubrium, so that they could not be referred to an arrest of development. The case is interesting, as establishing the fact of the existence of a purulent inflammation with perforation during intra-uterine life. Troeltsch had already mentioned the frequency of perforation in new-born children.

Voltolini[2] narrates a case of total deafness from a blow on one side of the head; interesting from the fact that the autopsy revealed nearly similar fractures through both petrous bones. A soldier was struck with a stool on the left side of the head, fell senseless, and, on recovering consciousness, was totally deaf. Eleven days after he died, and an extravasation of blood was found around both auditory nerves, the temporal was separated from the sphenoid bone along the suture, and a fracture ran through the roof of the tympanic cavity, the promontory and the porus acusticus internus separating the fenestra rotunda from the cochlea. The same fracture was found in each petrous bone, the only difference being that there was blood in the cavities of the left ear, but none in those of the right.

In a series of dissections of fifteen cases of fatal otorrhœa, Troeltsch[3] has added some valuable contributions to our knowledge of pathology and of the course by which these cases become fatal.

In a case of purulent inflammation of one year's duration with polypus, caries of the labyrinth wall of the tympanic cavity had resulted in a fistulous communication through that wall just above the fenestra ovalis, through which the purulent matter had passed into the vestibule and semicircular canals, thence through the internal cribriform plate along the meatus internus to the brain, causing a fatal meningitis of the base of the brain.

[1] Wiener Med. Wochenschrift, No. 28, 1869.

[2] Monatschrift für Ohrenheilkunde, No. 8, 1869.

[3] Archiv für Ohrenheilkunde, vol. iv.

In another case a polypus from the mucous membrane of the small cavity, a part of the tympanum above the deeper portions of the external meatus, had projected through the bone into the meatus, so that it could easily have been mistaken for a polypus of the meatus.

A third case offers the peculiarity of multiple unconnected abscesses in the brain, one on the side of the ear-disease, and one on the opposite side; the lateral ventricle on the opposite side also filled with purulent matter.

In the sixth case a purulent inflammation of right tympanum, *without a perforation of membrana tympani*, led to a perforation of the roof of the tympanic cavity, phlebitis of the vena mastoidea and transverse sinus with metastasis in the lungs. The membrana tympani was found much thickened, and had thus resisted rupture.

In the seventh case a purulent inflammation of middle ear had destroyed the stapes with the membrane of the fenestra ovalis and through the vestibule caused a pachymeningitis with two abscesses in brain and a phlebitis of the superior petrosal sinus. The phlebitis of this small sinus is explained by the small blood-vessel, which runs inward toward the mastoid process under the superior semicircular canal, entering the bone on the inner surface of the petrous portion, above and between the orifices of the meatus internus and the aqueductus vestibuli. This vessel was first described by Odenius,[1] and in two cases he was able to follow it into the superior petrosal sinus, so that we have here the circulation of the middle ear in new direct communication with this sinus.

Voltolini's investigations on the development of this passage were noticed in Dr. Roosa's report of last year.

The time at which the brain-symptoms showed themselves in the cases of abscess of that organ is interesting; in one the time was nineteen days, in another eight days, and in a third only thirty hours, before death.

Wreden[2] gives a case of external and internal hæmorrhage from a perforation of the right transverse sinus, the result of purulent inflammation of the right tympanum. The patient, a

[1] Medicinsk. Archiv, vol. iii., No. 4.

[2] Monatschrift für Ohrenheilkunde, 1869, No. 11.

soldier, in hospital, with supposed typhus abdominalis, began to complain of severe headache, without delirium, six weeks from the beginning of the disease. This symptom continued without the ears being suspected, for two weeks, when suddenly there was excessive venous hæmorrhage from the right ear, which could not be wholly checked. From this time vertigo and congestion of conjunctivæ were noticed, and three days after, with delirium and singultus, he died. The autopsy revealed an inflammation of meninges on that side with much blood and pus in cranial cavity; a phlebitis of transverse sinus with thrombus, which extended down into the bulb of jugular vein and into the veins of neck; the thrombus in parts showed purulent degeneration. A perforation, size of a pin, was found in transverse sinus just where the superior petrosal sinus enters, and in its outer wall another, where a considerable opening in the sinus and sulcus communicated with the mastoid cells. The whole of sulcus transversus and the mastoid cells were carious; there was no caries of the other bones around the ear. Middle ear was filled with blood-clots, and showed an old purulent inflammation with destruction of membrana tympani. Internal ear was filled with purulent matter. The caries was confined to mastoid process, and the case is interesting from the double perforation of the sinus, within and without, and from the inflammation of the sinus having been mistaken for typhus fever, as Lebert[1] has remarked is often the case. Wreden adds a synopsis of eighteen cases of such perforations from various authors, in none of which was there a double opening as in his case.

Dr. Robert Law, in the *Dublin Quarterly* for May, relates two cases of vicarious discharge from the ears in females: the first, a woman of twenty-one, was admitted to the hospital, complaining of violent pain in the head. The menstrual discharge had been suppressed for some months, and ever since she had complained of pain in each ear, and a sense of fulness in head, strong beating of temporal arteries, flushed face, and cold feet. On the first night after admission, she had a large hæmorrhage from each ear. The treatment adopted was to divert the blood from the head to the uterus, and to strengthen

[1] Virchow's Archiv, vol. ix., p. 401.

the constitution; leeches were applied behind the ears, hot foot-baths and aloetic purgatives given, but the hæmorrhage from the ear recurred on the third night. The treatment had little effect, the hæmorrhage from the ears was frequent and preceded always by weight in the head, pain in the ears, throbbing of temporal arteries, flushed face, and cold feet; all relieved as soon as the hæmorrhage had taken place. During a period of several months she had three attacks of erysipelas of the face. After a very profuse bleeding from the ears, she improved so much that she was advised to leave the hospital, but returned in a month. Twice during the next four months she bled from the ears, and discharged frequently large quantities of dark grumous blood from the stomach. A month and a half after that she had the most copious hæmorrhage from the ears, "the sheets were literally soaked in blood," and she now announced that about one month before there had been a slight appearance of the menstrual discharge. She ultimately got quite well, but not till the menstrual discharge was restored. No mention is made of the condition of the ears before, during, or after, and no examination seems to have been made; the state of the hearing is nowhere mentioned. If the drums had been partially or wholly destroyed, and the mucous membrane of the tympani exposed, the case would somewhat resemble a hæmorrhage from the nose, although we are at a loss to find a reason for the congestion taking place only in the two tympani. If we presuppose healthy ears, the discharge must have come from the epidermis, and that this should happen in such quantity as is mentioned seems impossible.

In the second case, that of a servant-girl, aged thirty, there were hæmorrhages from the eyes, epistaxis, hematemesis, a serous discharge from the ears, profuse lachrymation and perspiration, without, however, menorrhagia, the menstrual discharge being normal in time and quantity; these symptoms appeared at the menstrual period; the natural discharge apparently not being sufficient to relieve the system. No examination was made in this case, and we are not even informed whether the ears at this time performed their functions normally. The final result of the case is not given.

De Rossi[1] observed a case of vicarious menstruation in a patient suffering from purulent inflammation with a small polypus from the tympanic cavity. The inflammation in the ear began three years before, and from that time at every menstrual period there was a free discharge of blood from the ear, which continued four or five days, and then ceased, to return at the next period. After removal of the polypus, and cicatrization of the membrana tympani, the menses became normal, and the hæmorrhage from the ear ceased.

An unusual case of hæmorrhage from the ear is narrated by Hedinger[2] under the title "Apoplexy of the Middle Ear." A plethoric man, forty-five years old, after a hearty meal, suddenly felt intense pain in the left ear, accompanied by severe vertigo. This lasted till midnight, when suddenly several spoonfuls of blood were evacuated. The next morning there was an S-shaped rupture in the middle of the membrana tympani, with an ecchymosis around it, but no general congestion of the membrane; the manubrium was invisible, the walls of the meatus covered with blood. For the next few days there was frequent epistaxis and some fever. Three days after the hæmorrhage there was a purulent discharge from the ear, which under treatment ceased in about ten days. Several chills occurred during the illness. About two-thirds of the membrana tympani was destroyed by ulceration; the hearing for the watch and voice was completely lost from the beginning, and on the fourteenth day there was no improvement in this respect.

In 1869, Schwartze[3] published a number of cases of syphilitic affections of the ear, and recently Gruber[4] has given a short monograph on the pathology of these diseases.

A primary syphilitic sore in any part of the ear he has never seen; secondary eruptions, however, on the external parts of the ear have been frequently under observation, particular parts of the ear favoring particular forms of eruption.

[1] Gazette des Hôpitaux, No. 110, 1869.

[2] Med. Corresp. Blatt. des Würtemberg Aertzl. Vereins xxxviii., Nos. 9 and 10.

[3] Archiv für Ohrenheilkunde, vol. iv.

[4] Wiener Med. Presse, Nos. 1, 3, 6, and 10, 1870.

The point of insertion of the auricle and the lobule show most frequently a papular eruption, the other parts of the auricle an exanthematous eruption.

The external meatus, on account of the number of glands and papillæ in the skin, offers a particularly favorable condition for the development of condylomata, which, on account of the contraction of the meatus, easily spread so as to completely close the passage. The development of these condylomata is often exceedingly rapid, so that on examination the membrana tympani is hidden, and only masses resembling granulations can be seen.

The squamous eruptions are found on the auricle, but Gruber does not remember to have seen them in the meatus. None of the eruptions on the auricle offer any thing peculiar; those in the meatus, however, interfere with the functions of the ear, and also offer in their course certain peculiarities. In the deeper parts of the meatus it is very rare that a single condyloma is seen, but the course of the disease resembles more that seen on mucous membranes, and the eruption appears like plaques muqueuses. At the same time there is a loosening of the epidermis and the exudation of a sero-purulent fluid, which becomes gradually thicker from the intermixture of epithelial cells, till finally the disease exactly resembles an otitis externa. The swelling in the narrow space of the meatus also causes severe pain. The extension of the eruption on to the membrana tympani resembles the common acute or chronic inflammation of that membrane, and may cause perforation.

Non-specific inflammations of the ear in persons with constitutional syphilis have a marked tendency to ulceration; and circumscribed inflammation of the meatus, which usually after the evacuation of the pus heals rapidly, in syphilitic persons is very apt to form painful and obstinate ulcerations. Grumous tumors may form in either the osseous or cartilaginous meatus, but are most frequent in the cartilaginous portion. They may be painless, and disappear under a constitutional treatment alone, or by ulceration become exceedingly painful, and require a long local treatment.

Ulceration of the meatus and membrana tympani may be

primary, as already described; or secondary, as the result of a similar process in the middle ear.

Some of the exostoses Gruber does not hesitate to consider of syphilitic origin, as he has seen them develop in the meatus at the same time that syphilitic exostoses on other bones were developing. He is far from considering that all, however, have such an origin. Contrary to the rule in other parts of the body, they are usually painless in the ear. He has observed and described[1] several cases where such an hyperplasia of the bone of the meatus was associated with a similar affection of the osseous portion of the Eustachian tube.

As would be expected from the frequency of syphilitic disease of the mucous membrane of the throat and nose, the mucous membrane of the middle ear is the most liable of all the parts of the ear to be affected. Mucous papules may appear in the Eustachian tube and tympanic cavity; may heal spontaneously or ulcerate, and cause great destruction. Where the membrana tympani is involved in the ulceration, there is great pain, which continues till the ulcerative process is checked, although in other non-syphilitic inflammations the pain ceases as soon as the membrana tympani is perforated. The most frequent form of ulceration, however, is due to a direct extension of a pharyngeal ulceration into the ear, and its results in the ear may be the same as those from a common otitis media.

Periostitis of the mastoid process following otitis media, without a perforation of membrana tympani or any otorrhœa, Gruber has found very frequent in syphilis, and he suggests that the lymphatic swellings in this region are rather due to an irritation of these glands from the inflammation in the ear than to the general disease. The whole course of the otitis in a syphilitic person is more chronic than in other persons, but the results are the same as from an equal amount of ulceration without this specific cause.

The hypertrophic form of otitis is particularly common in syphilis, but offers no peculiarities except a marked tendency to the formation of pseudo-membranes and polypoid growths in addition to the development of connective tissue in the substance of the mucous membrane. Occasionally there is seen

[1] Lehrbuch der Ohrenheilkunde.

an hyperplasia of the bone within the tympanic cavity either in spots or over a large surface, and complete anchylosis of the stapes may result from such growths.

The appearances found in the inner ear in syphilis have been mostly the results of disease in the middle ear. Hyperæmia of the middle ear is accompanied often by a like hyperæmia of the labyrinth which predisposes to an extravasation of blood, and such extravasation Gruber considers as probably the cause of sudden and total deafness. He also suggests that in syphilis an inflammation with exudation in the labyrinth may come on suddenly in a previously-healthy ear, and says that one dissection which he has made supports this view.

In closing, Gruber cautions against trusting to remove the disease of the ear by treating the constitutional affection only; although he would not neglect the general treatment, he considers that local treatment is necessary for a perfect cure.

For thoroughly cleansing the deeper parts of the meatus in cases of purulent discharge, Plat [1] has constructed a sort of double-current catheter which would seem to answer the purpose admirably. It consists of an L-shaped tube, one end of which is covered with rubber to be inserted air-tight into the meatus externus. Into this large tube a small straight tube is inserted throughout its length. The water from a douche, entering the end of the smaller tube, fills the meatus, circulates around this, and passes out through the larger tube.

Gottstein [2] recommends pressure in otitis externa where the meatus is narrowed. He directs that a compressed sponge be inserted as deep as possible into the meatus, and on this that warm water be dropped; the sponge to be left in for six hours, and to be moistened with water every two hours. Usually only one application is necessary. He claims that the disease in all cases is shortened and in many is immediately checked.

In two articles of real practical value [3] Lucae gives his methods of treating chronic purulent inflammation of the tym-

[1] Bull. Gén. de Thérapeutique, May 30, 1869.

[2] Berliner Klinisch Wochenschrift, No. 43, 1869.

Monatschrift f. Ohrenheilk., No. 4, 1870. Berliner Klinisch Wochenschrift, No. 6, 1870.

panum. In the majority of these cases he has found that they were accompanied by granulations, not only in the middle ear but along the Eustachian tube and in the pharynx, and this condition of tube and pharynx keeps up the inflammation in the ear. He directs treatment more especially to the Eustachian tube, and has seen the best results from the insufflation of dry powders through the catheter into the tube. For this purpose he recommends muriate of ammonia, sulphate of zinc, alum, acetate of lead, and sulphate of copper. The addition of a small amount of camphor to any of these he thinks is of advantage. The powdered sulphate of copper is the most valuable in granular pharyngitis. The advantages of the powder over strong solutions are, that we get the greatest action in the tube where it is needed, without the risk of inflammation of the tympanum from the unexpected entrance of considerable quantities of fluid. Where only a very mild action is required, Lucae prefers the injection of liquids by Gruber's method. For the granulations in the tympanum, sulphate of copper in substance or solution (from two to five grains to an ounce) is highly recommended.

One cause of the frequent failure to cure in these cases is the insufficient or imperfect application of the astringent instillations. To remedy this, Lucae uses what he calls a prolonged ear-bath, by means of which he keeps the solutions applied to the desired parts for any length of time, without interfering with the occupation of the patient. A medium-sized glass tube is bent at a right angle, with a long arm about one inch in length, and a short arm about one-half inch in length. The long arm is covered with rubber tubing, and inserted tightly into the meatus; into the shorter arm, which stands upright, the solution is instilled drop by drop, till the tube is nearly full. The patient is now able to move about, and the solution can be thus retained as long as desired. Previous to these applications the ear is to be thoroughly cleansed by the double current of Plat, already described. At first, the solution is retained for half an hour twice a day, but the length of time can be increased to several hours if desired.

Gruber[1] mentions a pruritus cutaneus of the meatus, the symptom of which is an intense itching of the meatus, without any other objective or subjective symptom. It comes on most frequently in persons of middle life, who have some disturbance of circulation. The affection was first noticed and described by Hebra. Gruber recommends, as palliative, watery and oily instillations into the meatus, and for radical cure the repeated painting of the part with a solution of argenti nitratas, one part to six or eight of water, till reaction takes place.

Dr. F. E. Weber[2] recommends, for the constant and severe itching and tickling in the ears, the instillation of spiritus vini in the meatus. Spiritus vini (eighty to ninety per cent.) to be instilled morning and evening into the meatus till it is filled, and to be retained for five minutes; the ears afterward to be protected carefully from cold, in order to avoid the risk of furuncular inflammation. He says that, in from three to five days, the trouble is entirely relieved. Occasionally a minute portion of sublimate, or a mixture of white precipitate and camphor, is added to the alcohol. He considers the same application the best means of checking an otitis externa, if seen before suppuration or furuncular inflammation has set in. In several cases he makes the application thrice daily; in slighter cases only twice, in the same way as above.

Schwartze[3] recommends the galvano-caustic for the destruction of granulations in the meatus and tympanic cavity, and states its advantages over other caustics to be: 1. The short duration of the necessary treatment; 2. Short duration of pain; 3. The relatively greater certainty of the result. He has never seen any irritation of the brain or other disadvantage follow the operation, and has seen one old perforation close after it. Once, after removal of a hard, fibrous polypus, which completely filled the meatus, erysipelas of face and a cicatricial contraction of meatus followed.

Jacoby[4] also claims excellent results from the galvano-caustic treatment of new growths in the ear, and in his article

[1] Allg. Wiener Med. Zeitung, No. 52, 1869.

[2] Berliner Klinisch Wochenschrift, No. 20, 1870.

[3] Archiv für Ohrenheilkunde.

[4] Archiv für Ohrenheilkunde, vol. vi., Part I.

on the subject gives minute directions for the technical application. The treatment of a case of very hard fibroma of the meatus, complicated with chronic periostitis of the mastoid process and chronic purulent inflammation of the middle ear, with perforation and polypoid growths of membrana tympani, is given minutely. The patient, a girl, fifteen years old, had had an otorrhœa for four years. When first seen, there were great inflammation and pain over the mastoid process, a profuse and fetid otorrhœa, and the meatus was completely filled by a very firm growth from its posterior wall. This growth was so firm that it was found impossible to remove it by Wilde's snare, and the treatment by galvano-caustic was undertaken. The result was most satisfactory, and, after some twenty-one applications of the galvano-caustic and the occasional use of laminaria to dilate the passage, the walls of the meatus were free from any abnormal growths, the discharge had ceased, the membrana tympani became normal, and some two months after the last cauterization the perforations were nearly closed, and there was no sign of a recurrence of the growths. During the treatment, the patient had an attack of measles, and during this, for the first and only time, there were symptoms of meningeal inflammation and an increased inflammation of the mastoid process, but both yielded readily on the application of leeches.

Other cases of a less severe and obstinate form are given, viz., a soft polyp from the meatus removed partially by Wilde's snare and the residue destroyed in three applications of the galvano-caustic; two cases of polypoid degeneration of membrana tympani permanently cured, the one in seven applications, the other in one.

The appearance, in 1868, of Brenner's very thorough and scientific investigations[1] on the reaction of the auditory nerve to the constant electric current has called forth various opinions from writers; while Schwartze,[2] Schwanda,[3] Bettel-

[1] Untersuchungen and Beobachtungen über die Wirkung Elektrischer Ströme aüf das Gehörorgan. Leipzig, 1868.

Archiv für Ohrenheilkunde.

Oester Med. Jahrb., xxiv., p. 163

heim,[1] and others, have denied Brenner's results in the most emphatic manner, Erb[2] and Hagen[3] have confirmed them by series of careful experiments. In a supplement to the second part of Brenner's work, which appeared last year, it is clearly shown that his opponents had not used the cautions on which he lays particular stress, and consequently that they had not fairly tried his method.

Such being the case, and with the results of Erb and Hagen before us, the method deserves further trial, especially as Moos[4] gives full particulars of a case of nervous deafness from cerebro-spinal meningitis which was greatly benefited by the constant current applied in Brenner's method. On the third day of the disease, the deafness of the patient had become complete; on the thirteenth day she began to hear somewhat, and at the end of a month could understand words spoken directly into the left ear; and some time after she could understand at the distance of one or two feet from the left ear. The right ear remained totally deaf. For the next year there was no further improvement, although the ears were treated by catheterization, vapors, etc.

The examination by Prof. Moos, with the constant current, gave a negative result in the right ear; in the left ear, however, the subjective noises were much diminished by AD IV, and the hearing was improved, for the voice from two to six paces and for the watch from three to six feet. After four applications of XI 160 AD the voice was heard at fifteen paces, the subjective noises were much diminished, and the head-symptoms disappeared. The subsequent applications produced no further improvement. Considering the utter uselessness of all previous therapeutic agents in such cases, the result here may be considered encouraging and a still further recommendation of Brenner's method of application.

It has been known for some time that, for testing the conduction through the bones of the head, the dominant note of the tuning-fork only was useful, and that the over-notes inter

[1] Wiener Med. Presse, 1868, No. 23.

[2] Archives of Ophthal. and Otology, Part I.

[3] Pratische Beiträge zur Ohrenheilkunde. Leipzig, 1866 '69.

[4] Archives of Ophthal. and Otology, Part I.

fered very materially with the test. Politzer[1] has found that by small metallic clamps attached to the ends of the vibrating arms of the fork, only the dominant is obtained, and by the use of such clamps he claims that the patients can give a much more decided answer in regard to the place where the sound is heard than is possible for them with the simple fork.

The clamps are made to surround three sides of the prismatic arm of the fork, and are fastened by means of a small screw. The note of the fork is also raised by these clamps so that when they are fastened on the ends of a fork C the tone is raised to the fourth above, F; as the clamps are carried downward, the tone becomes higher and higher through a whole octave, so that it is possible, by altering the position of these clamps, to get all the tones up to an octave above the musical fourth of the fundamental note of the fork.

Besides the articles in the medical journals and several pamphlets, many of which have been quoted, two works have appeared in the last year so full and original that it is impossible to give a *résumé* in this place. Rüdinger has published the results of his investigations on the comparative anatomy and histology of the Eustachian tube, with chromo-lithographic illustrations from microscopic photographs. Gruber has published a complete treatise on the diseases of the ear, with beautiful woodcuts of the anatomy and pathology, and two tables of chromo-lithographs of the membrana tympani. The work is particularly valuable for its accurate clinical histories, the arrangement of its anatomical descriptions, and for its microscopic investigations. Both will be found of great value to the student, the practitioner, and the teacher.

[1] Wiener Med. Presse, No. 13, 1870.

INGROWING HAIRS FROM THE TRAGUS RESTING UPON THE MEMBRANA TYMPANI. By Robert F. Weir, M. D.

In the year 1866, I noticed that a gentleman of my acquaintance, some sixty-odd years of age, whom I knew to have slight chronic simple catarrh of his ears, acted in a rather strange manner. He would, in the midst of a walk, or more frequently in conversation, suddenly and rapidly shake his head to and fro, inclining his right ear downward at the same time, in fact going through the motion that dogs and other animals do to shake the water or flies off. On asking him what was the matter, he said he felt something moving at times in his ear with a rattling, dry noise, especially in eating and yawning, and that it was extremely troublesome to him. He consented finally to let me look into his ear, and I found that several of the long hairs that sprang in abundance from the tragus had passed inward, and their free ends were resting in contact with the membrana tympani of the right side. The offending bodies could be seen to rub against the drum whenever the jaws were set in motion. There was no congestion visible of the canal or drum. The hairs were easily seized and removed, the attachment to their follicles being very easily overcome—whereupon he experienced immediate relief; though, since then, he has sought my assistance several times for a similar trouble affecting not only the same but the opposite ear. He was advised destruction of the hair-follicles, or, in lieu of this, epilation, and daily combing outward the hairs growing in this region.

Since then, I have met with two similar cases—one in a middle-aged laboring, man, and the other, as in the first case, in a man in advanced years. So far as my reading goes, these cases are unique, though undoubtedly they have been met with by other aurists.

COMPLETE CUTANEOUS OCCLUSION OF THE LEFT MEATUS AUDITORIUS EXTERNUS, WITH HYPEROSTOSIS OF THE OSSEOUS PORTION.

By William W. Morland, M. D., of Boston.

The patient, a delicate girl, twelve years old, came from Illinois, with her parents, to consult Dr. H. W. Williams, who referred the case to me, and kindly assisted me in the operation subsequently performed. This was in March, 1864, and no report of the case has hitherto been made, because I have waited for information as to its ulterior progress, and to learn the actual condition of the patient.[1]

Appearance of the Parts on First Examination.—External ears well formed, and nothing unusual noticed, until closer inspection showed the left meatus occluded by a cutaneous layer. This appeared as if a perfectly natural and smooth extension, or prolongation, from the common covering of the auricle. It was not red nor uneven, nor as if thickened by previous or existing disease; but white, and uniform in appearance with the surrounding skin. I looked upon it as a *congenital* condition, although the child's mother said it followed an attack of measles, which she had when two years old. I am inclined to believe that the other ear, which was affected with an otorrhœa, afforded the foundation for the opinion. The *right* meatus was somewhat reddened, and there was, as stated, a purulent discharge, moderate in amount, but of quite offensive odor.

Condition of the Parts as ascertained after Etherization. Operation.—The patient being etherized, I made a crucial in-

[1] The desired information reached me, unfortunately, *the day after* the Annual Meeting of the Society, July 20, 1870. By the courtesy of the Publishing Committee, I am enabled to append the result of the case, unknown at that date.

cision of the membrane closing the meatus, and removed the four resulting flaps with small curved scissors. An aperture of about the size of a crow-quill presented itself, through which a probe could be readily passed for some distance, impinging, finally, upon a barrier—perhaps the membrana tympani. Lining-membrane of the meatus nearly, if not quite, normal; evident encroachment of bony material—for the most part regularly distributed (irregularities being noticeable in one or two places) around the osseous portion of the meatus—*hyperostosis.* No view of the inner portion of the meatus could be obtained.

Without much expectation of advantage, I inserted a piece of compressed sponge; and, in a communication subsequently made to the physician who was to take charge of the patient, suggested the use of a small funnel-shaped tube, made of gold, if worn without inconvenience or irritation.

On careful examination of the *right* meatus, carious bone was at once detected; there was much swelling of the lining-membrane, but no discoverable hyperostosis or exostosis. By reason of the swelling and narrowing of the meatus, no satisfactory view could be obtained, and consequently no account can be given of the state of the membrana tympani. The child could hear, but very imperfectly; she engaged in conversation, but her articulation was harsh, unnatural and dissonant. No estimate of the hearing-distance was made.

From the amount of disease found, in connection with the delicate constitution and feeble health of the patient, but little hope could be entertained as to any improvement or favorable result. Tonics and measures suited to benefit the general health were advised, together with scrupulous cleanliness, and astringent and disinfectant instillations into the right meatus, which previously could have received but little attention.

The prognosis having been so decidedly unfavorable, I was both gratified and surprised to receive the following account of the patient, from the family physician, and only regretted not being able to present it, in connection with the report of the case, at the annual meeting.

After mentioning that he delayed replying to my inquiries in the hope of seeing the brother of the patient, from whom to

learn further particulars about her, but failing to do so, in consequence of his having gone to Colorado, he goes on to say: "The operation in itself, and in its results, was a success in every respect—more so, perhaps, than could have been reasonably anticipated. After her return home, subsequent to the operation, I used sponge-tents to keep the meatus from again becoming closed, syringing the wound at intervals of one, two, or three days, and changing the tents as often as seemed to be required. I then had a gold tube constructed by a dentist, so as to fit the auditory canal, and having a funnel-shaped opening externally, which she wore for a long time. The ear healed kindly, though it was some time—I should say two months—in healing. Her hearing continued to improve, and her speech also, though neither hearing nor articulation ever became perfect. She has developed into a modest, pretty young lady, has turned her attention to instrumental music, and has become quite a skilful player upon the piano. The family removed from this place to Colorado, nearly two years ago, where they still live. Olive has been married since they left this place, and I have not the pleasure of an acquaintance with her husband, but I understand he is a worthy man, and if he sought her for an intelligent helpmeet, and a devoted, affectionate and accomplished wife, I have no doubt she will fill the position."

The result is certainly satisfactory, and justifies the operation and the pains subsequently taken by the physician, Dr. Daniel E. Foote, of Belvidere, Illinois.

Imperforation, or rather occlusion, of the external auditory canal, by a dermoid layer, has been reported by several authors; but, so far as I have looked up the subject, the condition has, in the majority of cases, existed in connection with the entire absence or extreme deformity of the auricles. These were perfect and well shaped in my patient. Mr. Wilde reports cases of imperforation with and without abnormality of the auricles, and mentions one in which he "found the right auricle normal, but the meatus ended in a shallow *cul-de-sac*, lined by smooth, white membrane, which just admitted the end of the finger." The patient was a female, twenty years old; and the imperfect state of the organ had not been recognized until the sur-

geon was consulted in reference to inflammation, with purulent discharge from the other ear. There was no meatus in this instance. A crucial incision was twice made, and every thing behind the membrane found to be "perfectly solid."—(Wilde's *Aural Surgery.*)

Mr. Toynbee particularly refers to the fact that, generally, occlusion or absence of a meatus is conjoined with marked malformation, or with non-existence of the auricle, or of both auricles. After citing some interesting cases, he says: "In some instances the auricle is deformed without any abnormal condition of the meatus or tympanum; but as a general rule malformation of the external ear is accompanied by a defective development of the meatus and tympanic cavity." (*Diseases of the Ear*, English edition, pp. 13, 14.) Prof. Allen Thompson's "notice" of several cases of malformation of the external ear, published as long ago as 1847, in the *Edinburgh Medical Journal*, April, is confirmatory of the same opinion, and is referred to by the authors just named. See also their reported cases.

Dr. Weir remarked that he thought that no necessary connection existed between the occlusion and the external malformation, and cited two cases where the auricle was normal. Dr. Noyes also cited similar instances.

A CASE OF MALIGNANT DISEASE IN THE EAR.

By Dr. C. A. Robertson, of Albany.

The case which I present for the observation and consideration of the Society is one of importance, and to me has presented unusual difficulty. Mrs. H., the patient, is about forty years of age, delicately organized, of nervous temperament, light complexion, and anæmic appearance. Her attention was at first attracted to trouble in the right ear by "a roaring and rumbling" sound seven years since. She became deaf two years later, and three years subsequently an otorrhœa was established, which, although altered in character, continues now. When the ear began to discharge, an offensive odor emanated from it, that subsequently very nearly ceased until it began recently to be exhaled again. The otorrhœa was slight in quantity, and of a yellowish, watery appearance. Recently it became an excessively foul-smelling sanious discharge, which has caused irritation of the auditory canal and of the skin outside of the orifice. This change in the character of the discharge has taken place since the treatment that has been lately undergone.

Last January paresis of the right nerve of the seventh pair occurred, and the patient can only partially close the right eye, or corrugate the right forehead, and, in attempting to pucker the lips, as in the act of whistling, she makes a remarkable contortion of the mouth. The general aspect of the face on the affected side is expressionless.

She applied to me the first of June last, for opinion and advice, because she felt pain in the ear, and was deaf. Upon telling her physician that she believed her facial paralysis was owing to something wrong in the ear, and that she intended seeing some one who was familiar with ear-diseases, he

assured her that nothing ailed the ear, and that her deafness was owing to wax, which he would syringe out. How he explained the *otorrhœa* was not told. This judgment was rendered without examination of the ear at all; a habit of practitioners of medicine which is, unfortunately, too common.

On investigation, I discovered what I supposed to be a polypus, completely blocking the meatus auditorius, and almost reaching the orifice of the canal. An attempt was made to remove the growth by means of Wilde's snare, but it was impossible to get the loop of wire around any considerable portion. The first pieces of it removed were of dense fibrous tissue. The hæmorrhage resulting from removal of these pieces was inconsiderable, but the process was protracted by it. On a second occasion, the hæmorrhage was very free, and, on several successive attempts to remove portions, the flow of blood was so profuse as to fill a common finger-bowl in a few moments. This vessel holds fourteen fluidounces. The hæmorrhage was arrested each time by a tampon of cotton wet in a solution of persulphate of iron. On two occasions the hæmorhage recurred upon removal of the tampon while the patient was at home, some twenty miles away, and the profuse bleeding was arrested by the family physician, some one holding a finger tightly pressed over the orifice of the auditory canal until his arrival.

Astringent injections were made into the ear of the patient during the intervals of her visits, which took place about once a week. Persulphate of iron in solution was injected several times through an hypodermic needle into the substance of the intra-aural tumor. Caustic applications have not been employed.

The aggregate of all the portions removed would form a mass, I should estimate, about the size of a hickory-nut, but, to inspection, the tumor did not seem materially reduced in size.

A piece of this cacoplastic growth has been submitted to microscopical view. It presented the appearance of fasciculated sarcoma corresponding to plates in the exposition of *tumors constituted by embryonic tissue*, which may be found in

the *Manual d'Histologie Pathologique*,[1] by Cornil and Ranvier, of Paris.

[Dr. Robertson asked the view of the Society as to the proper procedure.

Dr. Agnew suggested that a microscopical examination be made, and then the removal attempted.

Dr. Roosa advised removing the growth under anæsthesia —the hæmorrhage to be stopped by plugging the meatus, if it should be excessive.

Dr. Knapp thought well of galvano-caustic for the removal of large polypi.]

Since this patient was seen by members of the Otological Society, her condition has changed somewhat. More of the tumor has been removed, and at the bottom of the meatus is a fibrous portion, which does not tend to protrude as at first. The lymphatic glands in front of the meatus and on the side of the ramus of the maxilla below the concha are enlarged. The discharge is less offensive in its odor. The hearing, which was sufficient to catch the sound of a watch ticking when placed in contact with the ear, is reduced to inability to detect the sound at all, whether the watch be laid against the ear or against any part of the temporal bone.

[1] See Première Partie. p. 118, Fig. 59; p. 125, Fig. 61; p. 141, Fig. 71.

THE MASTOID PROCESS IN INFLAMMATORY AFFECTIONS OF THE MIDDLE EAR. By D. B. St. John Roosa, M. D.

It is a well-recognized fact that the extension of an inflammation of the mucous membrane lining the cavity of the tympanum to that of the mastoid cells, and to the periosteum covering the mastoid process, is a very serious matter. Perhaps it is a complication or an aggravation of *otitis media*, second only in gravity to an affection of that part of the dura mater covering and running into the roof of the cavity of the tympanum. The prognosis depends more entirely, however, on an early recognition of the character of the affection, than is the case in an extension of an inflammation to the membrane of the brain, for, in an early, free, and deep incision through the periosteum, we have the means of a thorough local depletion, and almost always of arresting the inflammatory process. The early diagnosis of an invasion of any portion of the mastoid becomes then a matter of much moment. A delay in the recognition of the true state of things allows the extension of the disease to the brain, through the numerous foramina, which transmit the minute branches of the middle meningeal, or to the lateral sinus, and hence into the general circulation.

At an early period in my medical studies, my attention was turned to the importance of affections of the mastoid, by some cases under the care of my preceptor, Professor Alfred C. Post, and by his recital of several others which had come to a fatal termination, as a result of non-recognition of the dangerous nature of the affection.

During the last winter, I have again had my attention called particularly to this subject, by five rather important (as it seems to me) cases of inflammation of the mastoid, which

have been more or less under my care, one of which was fatal in its termination, after an operative *perforation* of the process, and also by an interesting case reported by Dr. C. R. Agnew to the New York Ophthalmological Society, in which the process was trephined with a favorable result. I beg, therefore, at some risk of passing over much in what I shall say that is already familiar to this Society, to give an outline of these cases, with some points in the diagnosis and treatment of inflammations of the mastoid, suggested by them, as well as a short account of the history of the operation of perforation of this bone.

Case I.—The first case is one that was under my care at the Manhattan Eye and Ear Hospital, and which has already been reported by my clinical assistant, Dr. C. I. Pardee,[1] but chiefly with reference to its being a case of otitis media caused by the use of the nasal douche. I saw this patient, who was a man of about thirty-five years of age, soon after the inflammation of the ears had occurred—which was about nine months before he presented himself at the hospital, in October last. He then had an *otitis media purulenta*, but the amount of pus discharged through the perforated membrana tympani was *slight*, and this, as I shall have occasion again to remark, is always a matter for serious consideration in such cases. The swelling of the mucous membrane of the cavity of the tympanum was very considerable, and there was great impairment of hearing. He heard conversation only when addressed by a speaker, say one foot from him. He was under my care for about eight weeks, improving very little, when he disappeared, and I next saw him some nine months after at the hospital, in an alarming condition. He complained greatly of pain in the head, which prevented him from pursuing his avocation, which was that of a plumber. The auditory canal of the left side was filled with granulations, the mastoid process was red, tender, and painful. In front of the meatus there was an abscess, and a small fistulous opening just above the same part. The hearing on that side was completely gone. On the other side the state of the ear was about the same as when I had last seen him. I made few incisions

[1] Medical Record, vol. iv., p. 530.

down to the bone, rather against the patient's will, behind, above, and in front of the ear, laying open the fistula. I found no dead or exposed bone, but quite a large amount of pus was evacuated. The patient immediately began to improve. In a few days Dr. Pardee removed a piece of the mastoid structure through the external auditory canal, the pain in the head disappeared, the suppuration from the mastoid ceased, the granulations were removed from the canal, and the patient resumed his occupation. In this case I am inclined to think that there was already some cerebral congestion, and that basilar meningitis or an abscess in the membrane, would have resulted, had not the free external openings been made.

The two following cases, which I take from the notes furnished me by Dr. David Webster, house-surgeon in the Brooklyn Eye and Ear Hospital, were under my care at that institution, and are also striking instances of the relief afforded by timely interference:

Case II.—"Eliza N., aged eighteen, had a discharge of pus from her right ear for two months. The discharge suddenly ceased, and the patient was attacked with severe pain and swelling over the mastoid process, which grew worse and worse for several days, and caused me to visit the hospital. Dr. Roosa diagnosticated mastoid periostitis, and at once, May 10th, made a free incision down to the bone. No pus was found, but there was a free flow of blood, which was encouraged by the use of warm water. The membrana tympani was found to be removed by suppuration, but there was only a slight discharge from the canal. A tent was placed in the wound, and a poultice applied over it." The next day the house-surgeon made the following note: "Patient has slept well, she has had no pain since the incision. Tent reapplied and poultice continued. May 16th, sixth day after she was first seen, the swelling of the mastoid was gone, there was no discharge of pus at any time from the incision, but there was a copious one from the meatus. Patient feels well. She was very pale when first seen, but the administration of iron and the cessation of pain have restored the normal condition. She has not been seen since."

Case III.—Margaret O., aged forty-eight, came to the hos-

pital June 21st. Three months before, she had variola, and in the third week of that disease a purulent discharge began from the left ear. This discharge ceased, when, a week and a half ago, great pain, preventing all sleep, set in. There was found to be a considerable swelling and puffiness above the ear, with tenderness behind it, but no swelling. There was considerable œdema of the lids, and the patient declared herself in great agony. The auditory canal was swollen, but scarcely any pus discharged from it. Dr. Roosa made incisions down to the bone above and behind the ear. From the latter pus escaped, and a probe passed in a direction slightly upward, and forward and downward, into the mastoid cells. The bone was roughened about this opening. The same treatment as in the last case was pursued. The warm douche was also applied and directed to be used at home. Hydrat. chloral, gr. xv., was ordered to be taken.

Dr. Webster saw the patient the next day, when the pain had entirely ceased. *June 28th.*—The condition of things is much ameliorated. No pain, no tenderness. Fistulous opening exists. Ordered the employment of Politzer's method, and the warm douche (Clarke).

July 12th.—A minute opening about one-quarter of an inch from the insertion of the auricle still exists. The probe passes upward and forward into a superficial opening in the bone. No swelling, pain, or tenderness, about the ear. Membrana tympani has healed. Hearing distance with the watch, six inches.

Case IV.—The fourth case is one that was under my care at the Manhattan Eye and Ear Hospital. William G., aged thirty-nine, came to the hospital June 13, 1870. In December, 1869, he first experienced a sharp pain in the left ear, which was most severe at night. This pain continued for two months, at the end of which time a discharge occurred from the ear, which has continued to a greater or less extent until now. Two months after, the mastoid process became swollen and tender, and it was opened and poulticed by a physician. A great quantity of pus was discharged, and the pain, which was severe, was relieved. About four weeks after this the pain in the ear again occurred, and the patient presented himself at

the hospital. His general appearance was that of a great sufferer; he was pale and haggard; his hands were tremulous, and his countenance was anxious. He complained of great pain in the depth of the ear, and in the head. The mastoid process was red, but not swollen or tender. The auditory canal was exceedingly sensitive. The membrana tympani had been removed by ulceration, and there was a thin coating of pus on the floor and walls of the cavity of the tympanum. Air was driven into the middle ear by Politzer's method, and leeches were applied to the tragus and mastoid the next day. Warm water was also frequently instilled. *June 14th.*—The pain in the depth of the ear has decreased, but there is more redness of the mastoid. Leeches and a poultice were ordered. I did not see the patient after his second visit, in consequence of absence from town, until the 20th, when I found fluctuation in front of the meatus, as well as great tenderness posteriorly, with an exacerbation of the constitutional symptoms. The patient was then admitted as an in-patient, and I proceeded to make free incisions down to the bone in front of and behind the ear. The bone was not exposed or roughened. A tent was applied, with a poultice, to be removed every three hours, and the use of the ear-douche directed four times a day. Patient slept well that night for the first time in some weeks, taking a fifteen-grain dose of hydrate of chloral. *June 28th.*—The patient has been free from pain since. The incisions have nearly healed. There is a slight discharge of pus from the auditory canal. He hears a watch when laid on the ear. His general condition is now very good, and he is discharged at his own request.

It is somewhat remarkable that in this case, where the symptoms had existed for six months, and in which an acute abscess had formed over the mastoid, there was no disease of the bone that could be detected. The disease never was more than a periostitis, while, in a case of much less severity to be detailed, death of the bone and meningitis occurred with a fatal result. I now think that a free incision over the mastoid should have been made when I first saw the case, although there was only some redness of the process and no tenderness. In all cases where there is deep-seated pain referred to the cav-

ity of the tympanum, which is not at once relieved by leeching and the douche, even if the mastoid cells do not seem to be involved, I should consider myself as giving the patient the benefit of a doubt by such a depletion as a free incision will afford. Experience shows that there is no danger in this procedure, while a neglect to make the incision may be, and I believe often has been, fatal.

These cases are but a type of many that all of us have seen, yet I have detailed them in order that they may be contrasted with others which are more important, although having the same general characteristics, and which, in their inception, were also simple cases.

Case V.—I first saw this case April 8, 1870, at the instance of Dr. Robert Hubbard, of Bridgeport, Conn., under whose care the patient was.

The following history of the case has been furnished me by Dr. Hubbard:

"I was consulted in December, 1869, by W. E. S., aged thirty-eight years, by profession a mechanic, with good physical development and unexceptional habits, on account of a severe influenza from which he was suffering, and which was at that time epidemic in this city. His mother and one sister, I have good reason to believe, died of tubercular inflammation. Hitherto he had suffered no severe illness since the ordinary diseases of childhood, from all of which he made perfect recoveries.

"The attack of influenza was characterized by severe irritation of the whole respiratory system, with marked impairment of the special senses of taste and smell. The auditory apparatus, however, was not at first specially implicated.

"I prescribed for his 'cold' several times during the acute stage, as an office patient, but he at these visits made no mention of any trouble about his ears. Later he reported that he had lost his cough, but complained of catarrh of the fauces and nasal passages, for which I prescribed the nasal douche and gargles, made stimulating and astringent by alum, chlorate of potash, chloride of sodium, tannin, etc. To the use of these he ascribed considerable improvement. Hitherto he had pursued his usual duties as a mechanic. I then lost sight of him

until about the first of April, 1870, when he consulted me for an annoying *tinnitus*, affecting only the right ear. At the same time he reported that he had occasionally, for several weeks immediately preceding, suffered moderate hemicrania of the affected side. Inspection showed marked enlargement of the right mastoid region, which he declared had at no time been the seat of pain and yielded no suffering under firm pressure. Specular examination showed a moderate degree of congestion of the membrana tympani, and by Politzer's method the Eustachian passage was found to be pervious. The middle ear was occasionally inflated, however, and warm-water injections of the meatus externus ordered daily at bedtime, and a blister directed to be applied over the mastoid process; at the same time, continued constitutional treatment by quinine, iron, and strychnia, as he had been the subject some time previously of malarial infection. Under this course the apparent congestion of the membrana tympani disappeared, but the tinnitus in no degree diminished. At this stage of the case, having met as well as I was able all rational indications, leaving to me only an empirical course, I advised him to consult Prof. Roosa, and he advised me to renew the blister to the mastoid region; also, to apply a leech to the tragus, and repeat it after a stated interval, after which he requested to see him again."

My notes, on seeing the patient, were, hearing distance right side two inches, with a watch that should be heard three feet; membrana tympani somewhat opaque, no light spot, handle of malleus injected. Eustachian tube allows the passage of a very feeble current of air. Patient complains of annoying tinnitus or buzzing sound in the ear. There is a very slight want of symmetry in the appearance of the mastoid, but no pain or tenderness in the part, and no pain in the ear. Two leeches were ordered to the tragus and a blister to the mastoid. One week later I again saw the patient; the symptoms were the same. I injected the middle ear with steam; he had pain in the ear one night. I advised that leeches be again applied.

These measures were faithfully carried out, but with no good results. The time having arrived for another visit to Dr. Roosa, the patient called at my office, when examination re-

vealed fluctuation at the summit of the mastoid process, indicating, however, a small quantity of fluid, and attended, as it seemed to me, with too little pain to be explained by the theory of a periostitis. I therefore advised him to postpone his visit to New York, and to poultice the tumor for twenty-four hours, and then report again. At his next visit I found the swelling and fluctuation slightly increased, and I freely incised the integuments to the bone, liberating about a half-drachm of thick, healthy-looking pus, without disagreeable odor. I then probed the wound, expecting to find denuded bone, but failed to detect a greater degree of roughness than is peculiar to that portion of the cranium. I advised him to keep the wound open, and favor discharge by poulticing. The discharge for the succeeding few days was little, but resulted in a marked diminution of the tinnitus, and a corresponding sense of relief to the patient. He now failed to report to me for about a week, and meantime, for lack of attention, the incision healed, and, when he presented himself again, there was a reaccumulation of pus in much greater quantity than previously. This I evacuated, and found it of the same character as before. Thereafter the wound was kept open, and the tinnitus disappeared, and the patient declared to me and others that he was "a new man." From this time my regular attendance ceased until May 12, 1870, when I was recalled, and obtained the following history:

He had continued in his improved condition until the evening previous, which he was passing in social enjoyment with his family and a brother who was paying him a visit, and while laughing violently at some burst of humor, he stopped suddenly and exclaimed, "There, I guess I have laughed too hard, for I have made my head ache." No further reference was made to his suffering until he had retired to his room at bedtime, when he informed his wife that he had an intense frontal headache; he also complained of rigors, and passed an uneasy, sleepless night, notwithstanding a resort to several domestic remedies. *May 13th.*—I found the patient still suffering severe pain through the forehead and temples. Pulse 70, regular, and with steady rhythm, tongue brawny, a thin, white fur; intellect clear, skin unusually open and feeling like the third stage of a paroxysm of intermittent fever, which

I confess I was disposed to consider it, inasmuch as he had previously suffered from that disease.

I did not consider the symptoms sufficiently clear to indicate anti-periodic treatment, and I therefore temporized by giving a mixture of morphia, nitre, aconite, and camphor-water.

May 14*th.*—I found him no better, skin still open, pulse slower (68), with slight unsteadiness of rhythm, coating still more inflammatory, headache the same, urine rather copious, intellect in the morning clear, but once had requested an imaginary window-frame to be removed from his bed, pupil unaffected, no intolerance of light or sound, temper cheerful.

I abandoned the malarial theory, and, expressing myself to the friends as apprehensive of basilar meningitis, consecutive to subacute inflammation of the mastoid cells, ordered an active cathartic and ʒ ss bromide of potassium combined with the iodide. *May* 14*th*, P. M.—Visited him in consultation with my partner, Dr. D. H. Nash. No relief; on the contrary, an increase of the cerebral disturbances; occasionally delusions and illusions of mind, and mostly of the ludicrous sort; pulse slow and somewhat staggering. *No pain in the ear or its surroundings.* Bowels had moved freely two or three times, urine still copious. No sleep. Continue the bromide potassium mixture; apply large blister to nape of the neck, and give twenty grains hydrate chloral, and repeat in four hours if necessary.

15*th.*—Had slept about two hours; general condition no better, decidedly humorous in his behavior; double vision without apparent strabismus; could not read; pulse 60, more irregular. Had less pain in the head, or at least said less about it. Continued same line of treatment with addition of gr. ij calomel once in four hours. Blister acted thoroughly.

15*th* (evening).—Condition little changed. Prognosis to family, fatal result qualified by suggestion of possible relief from trephining mastoid process.

16*th*, A. M.—Patient worse. Suggested the counsel of Dr. Roosa. Treatment the same. Met Dr. Roosa at 9 P. M., with Dr. Nash. Agreed to diagnosis of meningitis, with probable origin from disease of the mastoid cells. Determined on free explorative incision upon the mastoid process and use of tre-

phine it developments indicated it. Accordingly, Dr. Roosa made an incision one inch and a half long, parallel with the auricle down to the bone, permitting thorough examination with the finger as well as with the probe.

This means, however, failed on the part of either of us to discover either necrosis or denudation of bone for a long time, and the search and operation were about to be abandoned together, when the probe (a No. 1 Bowman), in the hands of Dr. Hubbard, caught in a little depression, and by considerable pressure passed the external table of the cranium into the interior of the mastoid portion of the temporal bone to the depth of one and a half inch without other resistance than that afforded by the external table. It was now determined to enlarge the orifice sufficiently to favor the escape of any pus that might be detained in the depth of the temporal bone. This was accordingly done, leaving an orifice three-eighths of an inch in diameter, but no great quantity of pus escaped (just a trace). Subsequent examination with the probe revealed a cavity, caused by disintegration of the mastoid cells, of considerable size. 17*th.*—First noticed dilatation of the pupils, with gradually-increasing drowsiness, attended with delirium. This condition continued, with occasional aggravations, until the 19th, when he passed slowly into a state of profound coma, and died without convulsions at two o'clock on May 20th. No *post-mortem* examination could be obtained.

I have only to add a few words to the history thus so graphically given by Dr. Hubbard. On careful examination, I found the membrana tympani intact, translucent. There was no bulging in any part of its surface. The patient heard my watch about six inches from the ear, a decided improvement upon the hearing power on the two occasions when I had previously seen him. *There was absolutely no tenderness in any part of the mastoid.* Beyond a very minute opening which was scabbed over, there seemed to me to be no abnormal appearance whatsoever in this part, and I examined it very carefully. On probing the minute opening above spoken of, which was the remains of Dr. Hubbard's incision, before the free opening was made, there was no escape of pus.

To my mind there are several points of interest in this case.

I. The absence of suppuration of the membrana tympani. It is a rare occurrence that the mastoid region becomes involved without a previous suppuration in the middle ear, involving this membrane.

II. The want of symptoms which indicated the true seat of the disease, until the formation of the abscess. The symptoms were rather those of a simple inflammation of the middle ear, being described by the patient under the head of tinnitus, fulness in the ear, and occasionally, but rarely, of pain. Certainly there was never any such pain as patients with inflammation of the periosteum usually complain of.

III. The interval of apparent recovery from these troublesome symptoms, after the evacuation of the abscess.

In reviewing the case, the conclusion seems to me inevitable that we had from the beginning chiefly to do with a subacute or chronic inflammation of the mastoid cells, which easily extended to the periosteum, and which smouldered until the eruption in the abscess opened by Dr. Hubbard. It was simply an inflammation of this part with less than the usual determination to the surface, and it was on this account the more dangerous. The second attack was essentially a new process, attacking the former seat of disease or *locus minoris resistentiæ*, induced by some exciting cause which the patient has overlooked.

The integrity of the central apparatus up to a late period is shown by the amount of hearing exhibited on the evening that the perforation of the mastoid was performed.

HISTORY OF THE OPERATION FOR PERFORATION OF THE MASTOID PROCESS.

Inasmuch as the indications for the perforation of the mastoid process are not very fully set forth in the text-books, a very small space being given to this important subject, I have thought that a sketch of the history of the operation, with what seem to be the indications for its performance, might not be wholly uninteresting or unprofitable.

From a monograph on this subject by *J. Arneman*,[1] Professor in the University of Göttingen, published in 1792, we

[1] Bemerkungen über die Dorchbohrung des Processus Mastoideus, etc.

learn that *Riolanus* (in 1649, according to Tröltsch) was the first author who inquired into the propriety of perforating the mastoid process, *in cases of occlusion of the Eustachian tube*, for the purpose of removing by injections through the opening morbid secretions in the mastoid cells, and cavity of the tympanum. *Rollfink*, in an anatomical dissertation, published at Jena afterward, in 1656, also advocated the operation.

I. L. Petit, according to Tröltsch,[1] was the first who actually performed it, which he did by means of a gouge and hammer. Then we come to Valsalva's case, published nearly a hundred years after the suggestion of Riolanus, which has been claimed by all the authors as a case of perforation of the mastoid and injection through it of the middle ear. One (Tröltsch) states that an otorrhœa was thus cured by Valsalva. I have taken the trouble to examine the original passage in order to verify this claim made for Valsalva, and, if I am correct, there is no such claim by Valsalva himself. He simply states that he injected a fistula of the mastoid in the case of a nobleman, but with what result he does not say. The passage is found in Valsalva's "*Tractatus de Aure Humana*," edition of 1742, p. 89. The following is the side-note:

"*Observatio ulceris ad processum mamillarem, per quod injecta, statim in oris cavitatem, licet undequaque illasam transmittebantur.*" The passage itself is as follows:

"*Adeoque mitto prolixius confirmare per quondam meam in viro humane observationem, de nobili scilicet viro, ulcere ad processum mamillarem cum hujus carie laborante in quod quæ injiciebantur, illico ad faeces perveniebant, adeoque a tympano, quo per illius processus sinuositates ascendebant, per tubam certe derivebantur*," etc.

Valsalva is here demonstrating the passage of fluids from the mastoid fistula through the Eustachian tube to the mouth, as well as the functions of this passage, and he seems to make no claim to have perforated the mastoid, but he simply asserts that he has injected a fistula in the process, and that the fluid thus injected passed into the mouth. Neither can I find any evidence in the passage or the context that his patient

[1] Text Book, p. 470, American edition.

was cured of an obstinate otorrhœa, as asserted by Tröltsch. We may, then, omit Valsalva's allusion, so far as any evidence from this passage goes, in the enumeration of those who have recommended or performed the operation of which we are speaking. The surgeon to whom we are indebted for having fairly established opening of the mastoid as a legitimate surgical procedure is *Jasser*, a German regimental surgeon, who, in 1776, first performed it.

His patient was a soldier who had suffered for many years from a suppuration and pain in the ear, which was not relieved by active but judicious antiphlogistic treatment. In this case there was an abscess of the mastoid and death of the bone, and thus the operation was performed under indications which any good surgeon of the present day would accept as peremptory; although *Jasser's* operation was a creditable one to its author, it has been misunderstood and classed by so correct a writer as *Wilde* in the list of the same operation performed with such indications as "obstinate deafness."

Arneman, in the pamphlet before alluded to, details five other cases in which the operation was performed, and claims that in only one was there a bad result, and then death ensued. This is the somewhat famous case of *Berger*, a Danish surgeon, who caused it to be performed on himself, and died of meningitis induced by the operation. Arneman admits, however, that it may be performed without avail.

The second case detailed by Arneman has no more accurate statement, as to the pathological condition of the ears of the patient upon whom it was performed, than that "*he was wholly deaf in both ears.*" The operation did no good, but caused temporary blindness and faintness during its performance.

In the third case there is also no account of the cause of the deafness; the result was, an improvement in the impairment of the hearing as long as the wound was kept open. The opening was maintained by means of a leaden probe until cicatrization occurred.

The fourth case was that of an old lady who had lost her hearing from a quartan fever. She had noise in both ears. The process was perforated, and injections of lukewarm water,

which passed out of the nostrils, were made. After the injections had been kept up four days, there was a complete restoration (*sic*) of the hearing, while the opening closed readily.

The fifth case was one of chronic suppuration in the ear, with acute exuberations. The result was, a cure after injectives for twelve days.

These statements must of course be taken with some allowance, inasmuch as, with the exception of two cases, the first and the last, there is no exact knowledge of the disease causing the symptoms, deafness and tinnitus—but even these show that perforation of the mastoid is not a dangerous operation, and that, when performed under such indications as those of Jasser's case, it is not only a very simple but a very beneficial procedure.

In Frank's[1] treatise on the ear, which is rather a cyclopædia than a text-book, several cases are alluded to, but here also the indications which directed the performance of the operation of perforation of the mastoid are wanting, and they are consequently useless as guides to the surgeon. Frank himself, however, gives the proper indications, although, like all the other authors, he underrates his subject.

Arneman, in a style of surgical writing that has now happily, with our more accurate knowledge, passed away, lays down the following indications for the performance of the operation. They are inserted here in order that the distrust with which surgeons have looked upon the interference with the mastoid process in aural disease may be accounted for:

I. In any case of absolute deafness, or in any case where the impairment of hearing is constantly increasing, and for which all other remedies have been used without effect.

II. When in case of an ulcer or suppuration of the ear the morbid material has become collected in the cells of the mastoid, or the cells have become carious. (This is certainly a good indication, and the one upon which Jasser acted.)

III. If the normal mucous secretion has become hardened or collected in excessive quantity.

IV. In cases where pain and noise, which would finally

[1] Practische Anieitung, etc, p. 347.

destroy the hearing, have existed in the ear for a very long time.

V. In cases of stoppage of the Eustachian tube not remedied by injection.

The simple operation of creating an external opening for retained pus, and thus preventing its passage to the brain and into the circulation, was thus so distorted from its proper application that the leading writers seem to have been in as great a state of bewilderment about it as were the English and American surgeons, until a few years since, in regard to the use of the Eustachian catheter.

The text-books either mention it to condemn it, or in such a way as to plainly show that they do not realize the true indications for its performance. So valuable a work as that of Wilde, for example, confounds such an operation as that performed by Jasser with the others quoted by Arneman, which were undertaken empirically, because the first operation had been successful, without any regard to the condition of the ear, but for the relief of a symptom, deafness. We must never forget, however, the great service, already mentioned in this paper, which Wilde did by advocating the free incision down to the bone in all cases of inflammation of the mastoid, a step which must of course precede perforation, and which will often obviate the necessity of the more serious undertaking.

In the general advance of our exact knowledge of diseases of the ear, the merits of the operation of perforating the mastoid were again discussed, and it has now been replaced where Jasser first planted it, on a true basis. Tröltsch,[1] in 1861, reports a case in which he perforated the mastoid with a probe, some days after he had made Wilde's incision, with only partial relief to the harmful symptoms of an acute suppuration in the middle ear, with perforation of the membrana tympani.

In such disrepute was this operation at that time, simply because of the unhappy fate of Berger, who caused it to be performed with no good indications, that Tröltsch confesses that he would have hesitated to undertake this proper surgical procedure with any but the simple instrument which he employed. The case was a successful one

[1] Virchow's Archive, Bd xxi., p 295.

Eight cases are reported by Tröltsch; that of *Petit's* is considered the first, and *Jasser's* the second, but Valsalva's injective of a fistula already existing is considered as an operation.

The operation may now be seen to be fairly established, and is frequently undertaken, it having been performed by *Follin*, *Turnbull* (Philadelphia), *Schwartze*, *Pagenstecher*, *Jacoby*, *Hinton* (London), *Agnew* (New York), *Colles* (Dublin), and by myself, since 1859.

Jacoby[1] has especially put the profession under obligations by his valuable report of a case with the indications for the performance of the operation. Very recently *Köppe*[2] and *Schwartze* report a case of epilepsy caused by retained pus in the middle ear, which was relieved by perforation of the mastoid.

For the performance of the operation the trephine is rarely used. The bone is nearly always found softened by disease in the cases requiring an opening into the cells, or, still more commonly, it is fistulous. A small gouge or the like is then a very good instrument with which to make or enlarge an opening.

Colles did the operation by means of a small one-quarter-inch drill. I think it important, before closing the opening with lint, to carefully syringe the opening with lukewarm water. Granulations in the external auditory canal, which may prevent the passage of pus, should also be carefully removed.

The site of the opening will usually be indicated by the seat of disease.

Fistulas are usually found near the summit of the bone, where a large cell exists, and next in frequency at the lower portion, where the air-cell is also large.

The centre of the bone is usually of a solid non-cancellated structure—although there is some variation in the anatomical condition of the part.

I may be permitted, in conclusion, to tabulate the conditions in which interference with the mastoid seems to be indicated:

I. The integument and periosteum should be fully divided

[1] Archiv für Ohrenheilkunde, a Bd. iv.

[2] A. f. O., Bd. v., p. 282.

over the mastoid in all cases in which there are pain, tenderness, and swelling in the part.—(*Wilde.*)

II. Such an incision should be made whenever severe pain exists, which is referred to the middle ear, which is not relieved by the usual means; i. e., leeches, warm water, etc.

III. An explorative incision should be made when we have good reason to suspect the existence of caries in this part.

IV. The mastoid bone should be perforated after such an incision whenever the bone is found diseased, or a small fistulous opening should be enlarged. It should also be perforated when we have good reason to believe that there is pus in the middle ear or mastoid cells which cannot find an exit by the external auditory canal.

V. The mastoid should be perforated in the case of a suppuration of long standing, with frequent and painful exacerbations.

OTITIS MEDIA, FOLLOWING THE USE OF A BOUGIE IN THE EUSTACHIAN TUBE—INTRODUCTION OF AN EYELET INTO THE MEMBRANA TYMPANI—RESULTS. By Henry D. Noyes, M. D., of New York.

November 1, 1869.—Mr. R., aged thirty-five, miner, Montana Territory, has been conscious of ear-trouble for two years —never had pain; moderate amount of tinnitus. Is able to hear conversation with difficulty. With watch, hearing in right ear is three inches, in left ear three inches. Both membranæ tympani have calcareous patches, are opalescent and thickened, not much sunken. Has some pharyngeal inflammation. Able to inflate ears. *December* 29*th.*—Have for four weeks been using applications to the fauces and pharynx, and the Eustachian catheter on both sides; tubes free, no mucous rattles. No improvement in hearing. To-day carried a fine whalebone olive-tipped bougie No. 00, into both Eustachian tubes through the catheter, entering to the distance of one and a quarter inches. The instrument met with no obstruction, and gave the patient very little pain. It was pushed in very gently, and allowed to remain in position for only a few seconds. About ten hours afterward severe pain began in the right ear, not in the left. The next morning, twenty-two hours after the passage of the bougie, patient came to my office in extreme agony. I found the right membrana tympani extremely congested, rather prominent, the handle of the malleus and the calcareous patches indistinguishable. Attempted to perform paracentesis, and gave exit to a few drops of blood and some fluid. Used warm-water douche freely; patient much relieved. (Ordered two leeches to mastoid and to meatus.) Eustachian tube entirely closed.

The acute inflammation developed into suppurative otitis media, the discharge finding vent by the opening in the membrane, which after between three and four weeks closed. For several weeks longer the drum-membrane continued to be deeply congested. The Eustachian tube became again pervious while hearing remained impaired; could only hear the watch when touching the meatus.

After the lapse of four months from the time when the bougie was used, the patient's condition was as follows: The left ear remained in precisely the same condition as before treatment was begun, the right ear which had undergone the acute inflammation was reduced in hearing power, from three inches by the watch, to close contact. The drum-membrane now nearly restored to its former condition, although presenting a little vascularity at the upper margin. The Eustachian tube open.

Patient is extremely anxious to have his hearing improved, and when the possible good effect of the introduction of an eyelet into the membrana tympani, according to Politzer's method was stated to him, eagerly desired to have the expedient tried. For such an experiment, the large diameter and straightness of the meatus were highly favorable. I provided myself with the needful instruments, namely, a small sickle-shaped knife, in the end of a bent shank made for the purpose, and which proved to be eminently effectual in incising the membrana tympani. I also had a broad spear-shaped needle on the extremity of a long stem which could be bent to any angle desired. I procured the hard rubber eyelet, 3 millimetres long, its diameter 2 millimetres by 1.5 millimetres, having two grooves at one end, which had the effect of making it tapering, and having no flanges at either extremity. I also obtained the forceps employed by Politzer, whose tips are closely in contact and slip into the lumen of the eyelet, which they hold by being spread apart by stiff pressure of the fingers on the blades, which bend at an obtuse angle. This vicious method of handling a delicate object was the source of sufficient trouble.

I was assisted in the operation by Dr. A. H. Buck. The atient sat beside a window, at which I could employ direct

sunlight. I made a vertical incision about 3 millimetres long behind and parallel to the handle of the malleus, in the lower and outer quadrant. Slipping the eyelet over the tips of the forceps, and pressing the blades apart to hold it firmly, I guided it down to the place of incision, but could not see it when close to the drum-membrane, because the meatus was fully occupied by the forceps. I was, therefore, obliged to trust the sense of touch in engaging the eyelet in the slit. When I supposed it to have been put in place, I withdrew the forceps, expecting to find the eyelet either in the slit or in the meatus. But I had not brought it out; it was not in the meatus; it was not in the membrana tympani. The disagreeable conviction forced itself on my mind that I had lodged the eyelet in the cavity of the tympanum. To do this much had been painful, and tested the patient's endurance severely. He was greatly alarmed at the accident, and submitted to prolonged and futile efforts for its removal with such courage as he could, but with extreme difficulty, oftentimes compelling me to desist because of his sufferings.

To facilitate my efforts to extract the foreign body, I enlarged the incision by making another from its lower end forward along the periphery of the membrane, and tried to excise the flap thus formed, but could not, because it yielded before the pressure of the knife. I could feel the eyelet in the middle ear, but because of its smoothness failed to seize it with hooks or forceps, or other instruments, of which I tried many. There was considerable bleeding, to aggravate the difficulties of the undertaking, and I was finally compelled to desist.

The patient was sent home with instructions to use leeches and morphia in case pain should be set up. He came again to my office next morning, and to my great rejoicing with the report of a comfortable night. The incisions had closed, but I pushed a probe through and inserted a piece of laminaria, afterward a small compressed sponge-tent; the opening was enlarged beyond the dimensions of the eyelet, but all attempts to get it out were unavailing. Four days passed without special incident, when perforation accompanied by slight purulent discharge took place.

The hole remained open for two weeks, discharge scanty;

hearing distance, watch-touching. The ear was quite free from pain, and tolerated the foreign body remarkably well, but the patient was greatly disquieted at its presence, and unwilling to entertain it as permanent resident. On April 26th, eighteen days after its introduction, I again tried to remove the eyelet, assisted by Dr. R. F. Weir.

The membrana tympani was slightly reddened, had a good degree of translucency, free from secretion. No traces of the incisions. In front of the manubrium at the upper and inner quadrant was a black spot, which I presumed was the eyelet shining through the membrane, and which had wandered away from its original location. My first attempt was to excise a large portion of the membrane circumscribing the eyelet. This would also include one of the calcareous patches. The patient was put under the influence of chloroform, in a semi-recumbent posture, before a good light. The first incision was parallel to, in front of, and close to the manubrium, nearly the whole vertical diameter of the membrane. The next followed along its anterior border from the upper end of the first cut, and was drawn backward in a curved line until it met the lower end of the cut. A loose flap was thus formed, attached by only a few fibres above. After a little manœuvring I seized it with the forceps and tore it away, and had the satisfaction of distinctly seeing the eyelet. I tried to coax it through the hole by very carefully working with a hook, but to my chagrin it eluded my efforts, and retreated up toward the roof of the tympanum out of sight. The next method was to force a copious stream of water into the ear with a syringe. After doing this a few minutes, the eyelet was seen to have been borne down by the flood to the edge of the opening—again I tried a delicate hook, whose bent portion stood at right angles to the shaft, and was about one and a half lines long. Happily this passed into the lumen of the eyelet, and brought it safely and triumphantly out.

When the patient came out of the effects of the anæsthetic we tested his hearing, and found the watch in this ear audible at three and a half inches. The size of the hole may be thus sketched:

Two days after the hole had contracted to half the size,

there has been trifling pain and discharge, which continued six days in all and then ceased. Again, in four days, discharge recommenced, the hole rapidly contracted, and on May 10th the orifice was completely closed after remaining open sixteen days. During this period the hearing maintained the degree of improvement stated, viz., watch at three and a half inches. Now, with the obliteration of the hole, hearing is, watch, on hard pressure. Voice at two feet. There is no secretion in the meatus, the membrana tympani a little uneven, has a slight blush about the vicinity of the recent hole; there are no visible scars. Eustachian tube fully pervious, no abnormal secretion.

The patient remained under observation for a month longer, with little or no treatment, and no change in his condition. The left ear, which had no such checkered surgical experiences as the right, continues in the same state as before treatment.

In detailing this case, which indicates an accident which may sometimes complicate the use of bougies, and the mishaps which befell an operator in his first attempts to insert one of Politzer's eyelets, I feel that I am only fulfilling a plain duty in the interests of truth. I would not let one case of suppurative otitis media be a conclusive objection against ntroducing bougies into the Eustachian tube, any more than against the employment of Weber's nasal douche. Nor should the accident of an eyelet's slipping, through clumsy manipulation, into the cavity of the tympanum, be a valid objection against attempting to introduce it in a more correct method. But mine is not the only case of this occurrence, and the difficulties of extraction are considerable. It is shown by this case, as has been known long before, that in some cases the perforation of the drum-membrane notably improves the hearing, but to maintain a permanent opening is the problem not yet solved. Prof. Politzer's eyelet has not conquered the difficulty, although it may deserve a yet longer experience.

Dr. Weir remarked that he feared that the result which, in Dr. Noyes's case, followed the use of the bougie in the Eustachian tube, might be cited as an additional reason for the

disuse of an instrument to which he attached a good deal of importance. He had, not only at the Ear Clinic of the New York Eye and Ear Infirmary, but also in private practice, for the past five years, tested its merits quite thoroughly, and felt that in obstruction of the Eustachian tube not yielding readily to Politzer's bag, the pump, or to the catheter, the bougie was of very material assistance. As to the dangers attendant upon its use, he had met with but two accidents in a large experience, and these were, in one case, acute purulent inflammation of the middle ear, and, in the other, emphysema, involving the eyelids, face, and neck, of the right side, producing, however, but temporary difficulty. These occurred from neglect of rules which, subsequently carried out, enabled him to avoid similar mishaps. The bougies used by him were of catgut, and on them were marked, first, the length of the catheter; then the distance to the isthmus tubæ, 24mm.; then the distance from this point to the tympanic cavity, 11mm., and finally the width of the cavity itself, 13mm.[1] The bougies ranged up to 1½mm. in diameter, or from Nos. 2 to 5 of the French scale. When the Eustachian tubes are simply narrowed, so that the correct position of the catheter would be ascertained by the otoscope, the introduction of the bougie is comparatively easy, but, when this diagnostic means failed, then tentative projections of the bougie beyond the end of the catheter were necessary.

Once engaged in the tube, the instrument was pushed onward as far as the isthmus, allowed to rest there a few minutes, and then withdrawn, and air gently blown in through the catheter. If the air did not readily enter the tympanic cavity, all forcible attempts to drive in the air were carefully abstained from, and the bougie reintroduced, either then or preferably at another sitting, and carried only to a very short distance, say one or two millimetres farther on, and the experiment resorted to, to ascertain if the tube was opened.

By thus introducing the bougie only a short distance farther than the point reached at a previous attempt, and guarding against its too rapid progress when overcoming the obstruc-

[1] He practically found the latter of but little use, having but once purposely carried the bougie across the tympanic cavity, with however no detriment to the patient.

tion, the danger of injury to the middle ear, when traversing the portion of the tube external to the isthmus, was avoided; and, by refraining from strongly forcing or blowing in air, after withdrawal of the bougie, until it was known that the passage was freely open, the danger from emphysema was also done away with. Especial care was taken to avoid blowing in air when the bougie showed traces of blood along the whole portion inserted. As a rule he found that, when the bougie had been properly inserted, on withdrawal it showed no trace of blood, except perhaps at the tip, and at this point mostly when used to *find* as well as to enter the Eustachian orifice.

The majority of obstructions, partial and complete, are met with in the first portion of the tube, though in several instances he had overcome total obstructions at its aural termination. Some time since, noticing the congestion of the malleus caused by the engagement of the bougie only as far as the isthmus (exceeding the congestion often caused by the use of the catheter), he had thought that these instruments might be used, in lieu of vapors and fluids injected into the tympanic cavity, for the purpose of inducing absorption of inflammatory products, but numerous essays proved them to be of but little value.

Rau's method of saturating the bougies with solutions of nitrate of silver had been used by him in several cases with marked benefit. In concluding his remarks, he stated that, while discarding the conical French bougies as dangerous, from the tapering ends being too long, yet he found a certain small amount of conicity of the catgut bougies of service. The conical ends could be made, if not found among those purchased, by rubbing them on emery-paper, etc.

A CASE OF EPITHELIOMA OF THE AURICLE AND MEATUS. By J. Orne Green, M. D., Boston.

J. M., aged sixty, night-watchman, entered Dr. Thaxter's wards at the City Hospital on April 21, 1870. He stated that some eight months before, without having ever had any previous trouble in the ears, an eruption appeared on the right auricle, from his description apparently a moist eczema. From that the present condition has gradually developed itself without pain or symptoms of any kind whatever. No treatment had been adopted from the beginning.

The lower half of the right auricle was found to be very much enlarged in all directions; the concha and upper part of the lobule were covered by a superficial ulceration, from which an offensive sero-purulent fluid exuded, forming a dark crust. The lobule was occupied by several nodules about the size of hazel-nuts, of a purplish color and very hard; between these were several bleeding fissures. The neighboring ganglia were not affected.

On examination with the speculum and Troeltsch's mirror, I found that the ulceration did not extend into the meatus, but that the whole inferior wall of the passage was swollen and indurated as far as the edge of the osseous meatus. The deeper parts of the passage were filled by a large mass of loose hairs, which were removed, and the membrana tympani was then seen to be opaque, somewhat swollen and congested along the manubrium. The hearing was considerably diminished on that side, the watch being heard only at the distance of two inches, and there were constant subjective noises.

The appearance of the disease leaving no doubt as to its character, excision was performed by Dr. Thaxter under ether,

the whole auricle being amputated close to the skull. The whole lower half of the cartilaginous meatus was then dissected out down to the edge of the osseous meatus, and found to be indurated. The remaining tissues appeared to be healthy. The bleeding was profuse, but easily checked by tying a few small vessels. Cold-water dressing was applied, and the wound left to granulate.

The wound healed rapidly, and at the end of a fortnight was not more than one inch in circumference. The process of healing then became slower, and, the granulations at the meatus threatening to close that passage, a pledget of lint was kept in it all the time. The granulations were occasionally touched with solid nitrate of silver, and stimulating lotions applied. At the end of four weeks the whole wound was cicatrized, except just at the edge of the meatus, the opening of which was now only about one-eighth of an inch in diameter. The hearing had improved, and the subjective noises were gone; the swelling and congestion of the membrana tympani had disappeared, leaving that membrane dull and somewhat thickened, but otherwise normal.

The patient now demanded his discharge, promising to return as an out-patient, but no more was seen of him for four months, when, on meeting him, I learned that after leaving the hospital he neglected all dressings, and the ear soon healed. The meatus I found to be closed by a firm layer of cicatricial tissue, the hearing power less than when last examined. There were no signs of any return of the disease, and he expressed himself as perfectly satisfied with the result of the operation.

In looking up the literature of the subject, I have been able to find but little. Neither the text-books on the ear nor on diseases of the skin mention the auricle as a likely seat of epithelial disease. In the *Gazette des Hôpitaux*, September, 30, 1869, M. Demarquay describes a case in a robust man, seventy years old, who entered the *Maison Municipale de Santé*. He had lost one leg from disease of ankle, and had had caries of one phalanx, also a hemiplegia on the right side, from which he had nearly recovered. At first a small wart appeared on the middle of the left helix, was scratched off, but

immediately returned; it was then cauterized with nitric acid, but gradually extended, and in seven months had formed a brown crust, with a hard, indurated base. Below this crust was an ulcerated, slightly-painful, bleeding surface, which extended in spite of caustics.

On entrance, the tumor occupied the upper part of the auricle, was 6 cm. long by 1½ cm. wide, more dependent in the middle than at its extremities; the base was indurated and adherent to the cartilage, its borders hard, defined, and red, the surface red, irregular, and ulcerated. On close questioning, he admitted shooting-pains in the meatus, but none in the affected part. The characteristics of the tumor left no doubt of its nature, and it was proposed to excise all the affected parts with the scissors, but the patient refused to submit, and left the hospital.

M. Demarquay remarks that in such cases all authors are far from partial to the knife. M. Sedillot considers the actual cautery sure of success, and in a patient of his fifty-five years old, in whom the whole auricle had been destroyed by cancroid in less than three months, and the disease had invaded the auditory canal, the actual cautery applied to the ulceration and repeated many times produced a firm and persistent cicatrix, which he claims could have been obtained in no other way. Velpeau, on the contrary, resorted to excision in the case of a patient, sixty-seven years old, where the growth had existed only two months. The tumor, size of a filbert, was firm, fleshy, ulcerated on the surface, and movable with the skin on the deeper parts; occasionally there were lancinating pains in it. When small it had been removed, but had recurred. As the neighboring ganglia were not affected, excision was considered practicable.

Malignant tumors of the auricle offer the peculiarity of rapid development which often renders the ablation of the part indispensable; in this they differ from cancroid of the lip, which develops slowly. Velpeau had already pointed out this fact, and in the case reported by him, *Gazette des Hôpitaux*, 1864, it enabled him to decide on the malignancy of the tumor, and he diagnosticated a cancerous tumor containing probably fibroplastic tissue and the elements of encephaloid cancer. Dr

Campbell states that many of the inhabitants of Nissal have tumors of the auricle, especially those afflicted with goitre. Two of them which he removed occupied the whole auricle, invaded the meatus, and affected the hearing, and their tissue resembled mammary sarcoma.

Brunner narrates in the *Archiv für Ohrenheilkunde*, vol. v., a case of epithelioma of the ear which he considers began primarily in that organ. For two years the patient, a healthy woman, aged fifty-two, suffered from severe itching in the right ear, and was in the habit of frequently scratching it with a hair-pin. A slight otorrhœa then began, without pain or other symptom. A few weeks after an exposure to cold she had severe pain in the ear, which soon diminished, but continued in slight degree. Two months after this the right facial nerve suddenly became paralyzed. Examination at this time showed the right meatus to be completely filled by a soft, reddish, spongy mass, exactly resembling granulations; the otorrhœa was slight and more mucous than purulent; the auricle and surrounding tissues of ear normal. A microscopic examination of a small piece of the growth, by Profs. Eberth and Billroth, showed an undoubted epithelial carcinoma. As the growth involved the labyrinth wall, no operation was attempted, and the treatment was symptomatic only. The pain increased, ulceration took place, and the auricle was partially separated. One year after the beginning of the otorrhœa she died. No autopsy was made.

The case which I have reported is interesting from the disease having extended from the auricle into the cartilaginous meatus, and yet having left the deeper parts intact, and from the result of the amputation, which shows that in such cases the complete closure of the meatus must be specially guarded against. In this case the seat of the disease allowed of its complete excision; if, however, the ulceration and induration had extended deeper into the meatus, it would have been necessary to resort to some other method of destroying the growth, and the galvano-caustic would seem to be specially adapted for such cases, as it gives the actual cautery in a very delicate and convenient form. The examination with the speculum is necessary to decide on the extent and seat of the disease, and the

result of this examination must determine the method of operating. If the disease has its origin in, or has extended into, the tissues of the middle ear, and especially if the wall of the labyrinth is involved, it would seem impossible to destroy it, as these parts are so minute and irregular, and so intimately connected with the deeper organs, the brain, and the labyrinth, that the chances would be that the disease had already extended beyond our reach.

A CASE OF MASTOID-CELL DISEASE TREPHINED.

By C. R. Agnew, M. D., New York.[1]

I shall state the case, making some intercurrent remarks, since some of its features seem to be interesting, and, if my inferences are correct, new.

Miss X., in middle life, caught cold and a sore throat, after exposure in the country on the 26th of August, 1864. Immediately afterward, she was seized with violent pain in the right side of the head and corresponding ear. An application of chloroform and glycerine in the ear aggravated the pain, so that it became "agonizing," banishing sleep. The insomnolence lasted with very little interruption for ten days, and was not relieved by hypnotics. The pain was deep in the ear, through the temples, and accompanied by dizziness and partial delirium. On Wednesday, August 31st, there was a *slight* discharge of pus from the external meatus, but not followed by any marked relief of pain. The discharge from the meatus continued, but at no time freely. On September 5th, a swelling began in the mastoid region, with tenderness and deep pain in the head, extending into the temporal and frontal regions. On the 30th of September, the swelling rather suddenly extended down behind the course of the sterno-cleido-mastoid muscle, as though pus were moving in the direction of gravity; at the same time the tumor over the mastoid became flatter. On the 2d of October, an incision was made over the mastoid, and a perforation of the wall of the same by a gimlet. Pus followed the incision

[1] The paper of Dr. Agnew was received too late for insertion in the order in which it was read.—Publishing Committee.

through the periosteum, and also on the withdrawal of the gimlet. Slowly the pain in the ear and region of the temporal bone subsided. I first saw the case a year after this, at which time the deafness of the affected ear was complete. Indeed, there had been no hearing from a few days after the first attack. The fauces and other ear were normal. The meatus of the diseased ear was closed by a boggy swelling, so that the region of the drum membrane could not be seen. The concha and mastoid region were tender to the touch, and over the centre of the mastoid was a small fistulous opening which passed into a narrow sinus, running through the bone toward the cavity of the middle ear. This sinus was so small that a No. 4 Bowman's probe passed with difficulty, and seemed to be arrested at a depth of three-quarters of an inch by a bending and narrowing of the calibre. The examination was made still more difficult by extreme sensitiveness of the mouth of the sinus. At this time the principal subjective symptoms were deafness in the affected ear, pain in the temporal bone, increased by fatigue or exposure to cold, apprehension of brain-disease, slight loss of memory, nervousness, wakefulness, and readiness to become frightened at slight noises. The face wore an anxious look, and the general system was run down. I felt that the sinus was not sufficient to open fully the seat of disease, and therefore advised an incision in the periosteum over the mastoid, and a free opening of the bone by the trephine. I felt assured that we had to do with a wide-spread inflammation of the temporal bone, complicated by hyperæmia, and possibly thickening of the brain-coverings near that ear, and that a free passage into the mastoid cells would be a wise procedure. I recalled the fact that the onset of the disease was peculiar. Instead of the case progressing, as otitis media usually does, to rapid abscess, and a bursting forth of pus followed by relief of pain, the pain persisted, was deep-seated, and by its severity and continuance seemed to involve the bony walls of the middle ear and entire system of mastoid cells. The fact that sore-throat existed at the beginning of the attack does not oppose this theory, since there is no reason to be found why a tubal catarrh might not pass rapidly through the middle ear to involve the

mastoid cells. While it is true that inflammation of the middle ear and mastoid cells is generally suppurative, there is no reason why it might not be marked by little suppuration and a bony hyperplasia. This view was strengthened by the fact that no rough or carious bone could be found by probing in the sinus. Hence the long-continued pain and tenderness, even after free incision had been made upon the mastoid, and a perforation into its substance.

Little change took place in the case until February, 1870, when I was called to see her for an alarming attack. She had been sick for a few days with pain in the left supra-renal region, unaccompanied by kidney-symptoms. For this pain she had taken, in divided doses, about two grains of morphine during three or four days.

Having occasion to make some efforts in packing a trunk, she became much fatigued, and went to bed; shortly after which, her attendant, being in an adjoining room, heard a loud call. Going in, she found the patient sitting on the side of the bed, complaining of a "general agony," "a feeling of intense wretchedness, and apprehension of brain-disease or paralysis." It was noticed that the mouth was drawn toward the left side from paresis of right seventh pair, and that articulation was difficult. Vomiting soon set in and continued almost constantly for three or four hours, and occasionally during the following twenty-four hours. There was no loss of consciousness, or any convulsions. This seizure was on Friday. I saw her on the following Wednesday. At this time the paresis of the seventh pair had gone; articulation was distinct but deliberate, and there were some loss of memory and a slight degree of aphasia. The face wore a peculiar vacant look when a question was put, and was instinctively turned toward some one present who might, perhaps, be found better able to reply accurately. I thought the attack to be one of basilar hyperæmia, in which the pneumogastric had been temporarily slightly involved. What pain there was, was referred to the left side of the head behind the well ear. It was determined that the trephining previously proposed should be done whenever the patient could be carried to town.

On February 21, 1870, I proceeded to trephine the mastoid

through a sweeping cut, using for the purpose a half-inch instrument applied with the pin in the mouth of the sinus, hoping thus to reach the centre of the disease. I removed a dense button nearly three-eighths of an inch thick, but reached only one small cell. The cells, which usually exist within a twelfth of an inch of the surface of the bone at the point trephined, were filled by dense bony growth. I was aided in the operation by Drs. William H. Van Buren, D. B. St. John Roosa, E. G. Loring, and E. L. Keyes, and it was concluded that we should not go deeper with the trephine. An effort was made, however, to enlarge the extension of the sinus by using a triangular steel bit, so that the entire depth of the track opened by the operation was about five-eighths of an inch. No depot of pus was reached, nor was there the slightest trace of caries to be found in the bone; the entire track seemed to be smooth even where we entered the single mastoid cell.

The usual dressings were applied, and convalescence was progressive. The suppuration of the incision was very free, so that no idea could be formed of the amount of pus flowing from the bone-sinus.

After a few days the patient was put upon five-grain doses of iodide of potassium with tincture of bark, which was increased to ten grains, and continued for some weeks. Since the operation, there has been a marked amelioration, and no recurrence of the special head-symptoms.

I am convinced by this and other cases in my experience that mastoid-cell disease is very common in ear-diseases in adults, that it may escape and does escape attention except when the physical symptoms of its presence are very grave and conspicuous, and that we often lose time by not making an early opening, and that even when such early opening is made we may fail to prevent a wide-spread inflammation of the bony parts involved, and that caries is not the invariable and immediate result of mastoid-cell disease, but that sometimes there may be, instead, an ostitis, with hyperplasia of the bone, filling a few or all of the cells.

FOREIGN BODIES IN THE EAR; IMPORTANCE OF A CORRECT DIAGNOSIS; METHODS OF REMOVAL; CASES. By Wm. W. Morland, M. D., of Boston, Mass.

Notwithstanding the triteness of the subject, its real and constant importance will perhaps justify me in occupying a few moments in regard to it.

Dr. Druitt somewhat quaintly remarks: "The surgeon should always make certain, by an examination with the speculum, that there is a foreign body present, before he begins poking instruments into the ear, remembering that a late eminent hospital surgeon is said to have dragged out the stapes while fishing for a small nail, which was not in the ear, after all."—(*Surgeon's Vade Mecum.*)

If any thing might be appropriately added to this wise caution, it would be that, while the surgeon should refrain from "poking instruments into the ear," before he knows whether there is any foreign body therein, he should do as little of it as possible if he does find one. It is by no means uncommon for persons to imagine they have something in their ears which ought not to be there—either by accident or by carelessness of their own. *Pins* are sometimes the offenders. Mr. Harvey, not many years ago, had only three cases of this sort to report, however; a somewhat small proportion for a busy practitioner. In one of these, a fatal result followed "otic inflammation extending to the brain." In another, such violent inflammation followed "fruitless endeavors at extraction," before the surgeon was consulted, that "alarming symptoms supervened," and the pin, not found at the time, was

discharged upon opening "an abscess, formed between the auricle and the mastoid process," a month afterward.

Only two instances of this sort have occurred to me. In one, the pin, which had been pushed in by the alarmed patient and her friends, in their efforts at extraction, until its head rested against the drum, was withdrawn by forceps.

In the second case, *there was no pin in the ear.* A young lady came in great haste and trepidation to my house, one evening, saying that she had dropped a medium-sized, black pin, with which she was scratching the meatus, into her ear. Thorough investigation, by gas-light, satisfied me that neither the pin, nor any other foreign body, was in the ear. Notwithstanding a positive assertion to this effect, the patient went home feeling very uneasy and not at all convinced—saying the pin *must* have dropped in, and she was sure she felt it there. About an hour afterward, a messenger was sent to tell me that the "very pin" had been found on the floor, beside the chair upon which the young lady had been sitting at the time it escaped from her fingers. It having been *black*, and no others having been used in the vicinity, it could hardly have been mistaken.

A wire loop as a means of removing foreign bodies from the ear.—In the *Biennial Retrospect of Medicine and Surgery* for 1867–'68 (New Sydenham Society), a communication of Mr. Hutchinson to the *Medical Times* (vol. i., 1868, p. 261) is referred to, in which this method is spoken of as "eminently successful and little likely to do harm." Six inches of fine wire, doubled into a loop, is the instrument. The patient is then placed on his side, and the loop passed into the ear as far as it will go, and then turned a little, gently. "At the first or second withdrawal, the foreign body will come out in the loop." I have called attention to this method for two reasons: *first*, I have had no experience with it, and would be glad to know if the members of the Society have; *secondly*, because it seems to me a method of very limited applicability, and that its recommendation is too wholesale and universal; the class of foreign bodies likely to be thus easily removed by it being, unless I greatly mistake, quite small in number. Thus it could hardly be expected to remove smooth, round, small

bodies, such as beads, buttons, etc.; nor would it be likely to succeed in cases wherein swelling and irritation had been induced by injudicious and unskilful attempts at extraction.

Insects in the ear.—In cases of this sort it is very desirable to remove the intruders at once, for, although they are likely soon to die, and so may be, for a long time at least, unnoticed, yet instances are on record of more or less serious ensuing trouble from their presence; in some cases, even abscess has been caused, and headache and giddiness are not unusual.

A remarkable case is reported in the July (1870) number of *The American Journal of the Medical Sciences*, by Dr. Harlan, who removed a mass consisting "of the head and first section, two wings, and three legs of a large beetle," from the right auditory meatus of a medical student, who "called to mind that thirteen years before, when a child, he was aroused at night by an agonizing pain in the ear, which was not relieved until a doctor, who was sent for, poured oil into the meatus." No pain, discharge, nor inconvenience of any sort had existed until lately, when a slight feeling of discomfort, fulness, and an itching sensation, with some dulness of hearing, led him to consult Dr. Harlan. No harm has resulted to the tissues nor to the hearing.

Some years ago I was consulted by a young woman, who said there must be "something alive" in her ear, and that, for nearly a week, something had been moving therein briskly, at intervals, with a buzzing sound. On inspection under strong sunlight, very rapid motions, as if of antennæ, could be distinctly seen close to, or in contact with, the membrana tympani. I poured oil into the meatus, with the result of immediate cessation of all the motions, sensations and buzzing; and then, washing out the ear by means of the syringe, dislodged a good-sized veritable bed-bug. The patient said she had been in the country, in an old house not free from the suspicion of such tenants. Mr. Hutchinson's wire loop would not have availed in the above case, nor in the one succeeding, of a much more serious nature.

Steel button in a child's ear; its firm impaction at the bottom of the meatus, in consequence of ignorant and violent efforts at extraction; removal.—A round steel button, per-

forated in three or four places, for the purpose of attaching it to clothing, and of the size of a small or medium pea, was introduced into the meatus of a child's right ear, on a Saturday about noon. Injudicious and quite violent efforts were made, by means of extracting and prying instruments, to remove the button, *without any trial by the syringe*, which doubtless would, at that time, have removed it easily. No impression having been made upon the button, except in the wrong direction, and much bleeding and pain having been caused, the child was brought to Boston, a distance of twenty miles, on the succeeding Monday, and I saw it about one o'clock P. M. It was a little girl, three and a half years old, apparently in much pain, and in no less terror, at the prospect of more work upon the ear. The meatus was filled with clotted blood On washing this out, swelling and inflammation of the lining membrane were noted in a high degree. The button could just be seen, glistening at the bottom of the passage. No efforts with the syringe were of the least avail, the button being, as it were, grasped and held back by the swollen membrane. With great care and gentleness, under ether, I tried, ineffectually, to lift it out by a slender probe bent at the end, and by a delicate scoop. As I was about to abandon all trials, and to advise antiphlogistic measures, and delay until the swelling and inflammation had disappeared, it occurred to me, while examining a companion button which the mother had brought, that the one in the ear might be withdrawn upon the point of the small steel drill which I now show to the Society. On the first trial, the instrument became engaged in one of the apertures, but so much force was required to withdraw the button, that the edges crumbled a little, and released the drill. A second trial, however, brought out the button upon the point of the drill. A degree of facial paralysis was noted, some short time subsequently, and there was some purulent discharge, but the child soon wholly recovered.

In view of instances of this sort, and which are only too common, it can never be a work of supererogation to counsel gentle manipulation and mild measures of treatment, nor to remind the general practitioner that *the syringe* should be his first resort, and we may even say, his only weapon. "*Tutò, citò, ac jucundè.*"

A CASE OF POLYPOID ANGIOMA CAVERNOSUM, SITUATED IN THE EXTERNAL AUDITORY CANAL, AND ORIGINATING BY A SLENDER PEDICLE IN THE MANUBRIUM MALLEI. Reported by Albert H. Buck, M. D., Assistant Aural Surgeon to the New York Eye and Ear Infirmary.

It will perhaps give additional interest to the case which I am about to relate if I preface it with a few remarks on the subject of aural polypi, giving a brief condensation of the present status of knowledge on that subject.

Up to the present time nearly one hundred polypi have been subjected to a careful microscopical examination, the result of which shows that a large majority of these growths belong to the class of mucous polypi. The fibromata or hard polypi rank next in point of frequency. As nearly as I can ascertain, about one in ten of all the polypi examined belonged to the class of fibroma. Besides these two varieties, Steudener has reported a case of myxoma, and Kessel two cases, one of epithelioma and one of a peculiar growth which he describes as a clot of blood in process of organization.

The mucous polypi, which constitute the vast majority of those met with in the ear, are now almost universally believed to originate in the tympanum. Histologically they are the same as the nasal and naso-pharyngeal mucous polypi. Originating in the mucous membrane of the tympanum, they are usually found to consist of a delicate but loose stroma of connective tissue, holding in its meshes either round, spindle-shaped, or stellate cells, and covered by a single or multiple layer of epithelium cells. That portion of the growth which is exposed directly to the influence of the outer air is covered

with ordinary pavement epithelium, while on the internal or unexposed surface there is usually found either simple cylindrical epithelium or cylindrical epithelium carrying ciliæ. Glandular elements or cysts lined with cylindrical epithelium are not infrequently met with.

In the true fibrous polypi the mass of the growth consists of a dense connective tissue, holding but few cellular elements among its fibres, and covered with pavement epithelium. While the former class of polypi originate, strictly speaking, in the mucous membrane, these fibrous tumors may be considered as outgrowths from the periosteum.

The epithelial polypus (cancroid, epithelioma) will be recognized by the presence of concentric epithelial globes, or at least of alveoli containing epithelium-cells.

The myxomatous polypus, even to the naked eye, will excite suspicions by its very gelatinous consistency. It is composed chiefly of a homogeneous gelatinous substance (containing mucin), in which are embedded either round, fusiform, or stellate cells with long outrunners, and a certain amount of loose fibrous tissue intermingled with elastic fibres. Its surface, like that of the preceding polypi, is covered with epithelium.

All these varieties, with the exception of the epithelioma, may be considered as non-malignant; that is, they display no tendency to encroach upon and destroy the neighboring tissues, nor do they possess any disposition to infect other organs secondarily.

The angioma, as its name implies, is a circumscribed tumor made up chiefly of newly-formed vessels, or of vessels in whose walls are newly-formed elements. Its occurrence at different parts of the surface of the body can scarcely be called a rare event. Virchow, in his admirable work on tumors, devotes nearly two hundred pages to this interesting subject. He subdivides the angioma into a number of varieties, and applies the term *cavernosum* to that variety which is characterized by the existence of a net-work of blood-spaces, occupying the place and fulfilling the function of capillaries. According to his view, the arteries, in a growth of this kind, pour their blood

into these spaces, from which it passes directly into the veins, and so back into the general circulation.

Such a growth as this, located in the external auditory canal, has lately come to my notice in the practice of the New York Eye and Ear Infirmary. As neither Virchow nor any of the writers on aural polypi mention the occurrence of any similar tumor in the ear, I have thought the case of sufficient interest to report it in full on this occasion:

George Algerer, nineteen, mechanic, was admitted to the New York Eye and Ear Infirmary, April 2, 1870. He states that, since he was seven years old, he has suffered from frequent attacks of earache, and an almost constant otorrhœa from both ears. At the same time he has been annoyed by noises of different character. Of late the sound in the left ear has been what might be termed a pulsating, humming noise; it is continuous, but, at regular intervals, corresponding apparently to the pulse-beat, it becomes louder. Running upstairs, or any other violent exercise, aggravates the noise very much. On waking this morning he found his pillow, as he states, covered with blood. The hæmorrhage, which came from the left ear and was unaccompanied by pain, continued in the form of oozing throughout the entire forenoon. This was the first time that any blood had been noticed in the discharge from either ear.

Patient's present general condition is good. Right meatus half filled with pus. Right membrana tympani entirely destroyed. Left meatus filled with blood, partly clotted. After its removal by syringing, an oblong, dark-colored body, about the size of a small pea, was found lying apparently free on the inferior wall of the meatus. At first sight it was supposed to be a foreign body, or inspissated cerumen. It was only after several vain attempts with the syringe that the small body was discovered to be attached by a long and slender pedicle to the stump of the hammer, which could be seen in the background. Dr. Robert F. Weir, to whom I am indebted for the case, then divided the pedicle with the scissors, after which the growth was readily removed by syringing. No appreciable hæmorrhage followed. Ordered insufflation of powdered alum.

June 25th.—Patient returned to-day, with the statemen that, about the middle of May, the noises and discharge both reappeared, and have continued ever since. On examination of the left ear, a pinkish vascular teat is found hanging to the stump of the hammer, and standing out in strong contrast with the pale granulations which form the background. Ordered instillation twice daily of ℞ tannin ʒ i, glycerinæ ℥ i.

Microscopic Examination.—Immediately after its removal the polypus was placed in a weak solution of chromic acid, the only preservative fluid which happened to be at hand at the time. From this it was transferred to alcohol, and, when sufficiently hardened, it was mounted in a mixture of wax and oil in equal parts. No precaution was taken to place the growth in such a position that the sections through it would include either the point of rupture or the stump of the pedicle. Fortunately, the middle sections included both of these points.

I shall not attempt in this place to give a minute description of the anatomy of this tumor, but simply refer you to the specimen under the microscope. The entire mass, as you will see, consists of blood-vessels, radiating from an irregularly-shaped central cavity, and separated by a net-work of fibrous connective tissue, holding blood-corpuscles in its meshes. In two or three of the sections a large vein can be followed from the central cavity into the remaining stump of the pedicle. In one of these, and in other sections, the point of rupture can be distinctly traced from the central cavity to the periphery of the polypus.

As the patient was asleep at the time of the hæmorrhage, it must be assumed that the rupture took place from natural causes located within the tumor itself. The constant pressure, which first caused a dilatation of the blood-vessels, then an obliteration of their walls at different points, and eventually the formation of this large central cavity, must have been the chief agent in producing the final rupture. Six weeks after the removal of the original growth a second makes its appearance. This occurrence, it seems to me, is a strong argument in favor of Virchow's view that an *angioma* is an independent new growth of vessels, just as much as an exostosis is an independent new growth of bone.

CASE OF ASPERGILLUS IN THE EXTERNAL AUDITORY MEATUS. By John Green, M. D., of St. Louis, Mo.

The patient, a gentleman thirty-eight years of age, remembers that two years ago an insect entered the right meatus. It was destroyed by pouring oil into the ear, and the incident was forgotten for sixteen months, during which time he made a tour in Europe. About eight months ago he was seized with rather severe pain in the ear, and became somewhat deaf.

The meatus was plugged with common epidermic masses, etc., including a small cockroach. The walls of the meatus appeared red in patches and denuded of epidermis; the membrana tympani was dull and somewhat macerated. Some flakes of epidermis, etc., were quite strongly adherent, requiring two or three washings with the syringe upon successive days to clear them away. A few dark points were noticed, dotting some of the flakes removed by the syringe, but their significance was overlooked at the time. Six months later he returned, complaining of much the same trouble as before. He had suffered but little inconvenience during the interval, although the ear had been "a little moist" at times. The meatus was found pretty full of a white substance of exactly the appearance of cotton, which was brought out by the syringe in large flakes, mingled with a little pus. The dark specks, dotting the flakes washed out by the syringe, were again noticed, and were this time recognized as probably the fructification of a mould fungus, of which the cotton-like white substance was the mycelium. The microscope confirmed the

diagnosis, and established the identity of the fungus with the blue mould formed upon a crust of bread.

The case is reported as showing the tolerance of the fungus, probably for two years, during which time it has excited two attacks of otitis externa with temporary dulness of hearing. It is interesting also in connection with the possible manner of its introduction, its original nidus being probably the body of the cockroach. Lastly, the character of the cotton-like mycelium, and the sporangia appearing as small, dark dots, gave to the diagnosis a considerable degree of certainty independently of a microscopic examination.

It has been impossible, so far, to induce the patient to submit to the treatment necessary to arrest the development of the parasite.

FORM OF THE EUSTACHIAN CATHETER; ESPECIALLY WHEN INTRODUCED BY THE OPPOSITE NOSTRIL. By Henry D. Noyes, M. D., of New York.

It is a common observation to find the two nostrils differing noticeably in size, and this the result of a deviation of the septum narium to one or the other, more frequently the left side. We therefore often choose a smaller Eustachian catheter for one side than for the other. I have, like most aural surgeons, experimented upon the best shape to give the instrument, and I have imitated the models which others give, as well as tried shapes which were of my own suggesting. I may with modesty remark that I have not found the forms figured by Kramer for the ordinary instrument the most suitable; the error in my judgment being that the beak is too long, and the sweep of the curve too great.

The shape which, for a catheter of $1\frac{1}{2}'''$, or a little more than 3mm. in size, I have come to prefer, is seen in Fig. 1. For a larger size I would have the beak a little larger, the curve the same. Curved in such a manner, the catheter finds entrance readily to the mouth of the tube, and when fairly engaged can be pushed up into it by the thumb and forefinger. (See Fig. 1.)

At the spot denoted by the dot,[1] I make a mark with white paint, which corresponds to the average distance from the tip of the nose to the ostium tubæ. It may, in some persons, be one-quarter of an inch more, in some one-eighth of an inch less.

[1] The dot, which has been omitted in the figure, should be placed between the word CO. and N. Y.

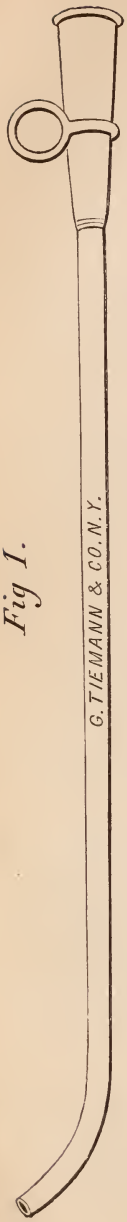


Fig 1.

But I desire especially to call attention to the modification which the catheter must undergo when it is to be entered by the opposite nostril. To be adapted to this exigency, it has been considered by writers sufficient to increase the length of the beak, adding to it about half an inch, at the same time curving it a little more, so that the bent portion describes nearly a quarter of a circle. By this elongation the point will reach across behind the septum and strike the trumpet orifice, and the unusually large size of the nostril which we enter gives space for the large curve of the catheter to play.

It is indeed true that, by an instrument thus fashioned, we can touch the left ostium from the right nostril; but we touch it in a manner wholly unfavorable to entrance into the tube, because the opening of the catheter points, not in the axis of the tube, but across its axis, directly upon the outer wall of the pharynx. The current of air is directed, not toward the middle ear upward, outward, and backward, but simply across the axis of the Eustachian tube, and, if it pass up the tube, can only do so after being reflected from the outer wall of the trumpet orifice.

The correctness of these statements commends itself to the reflection of every surgeon, and they are at once shown to be true by resorting to the dead subject. I have verified them in this way, and upon a dried preparation in which the soft parts about the pharynx are preserved in very nearly the natural relations. I have learned in what way a catheter must be shaped so as to enable it, not only to pass behind the septum to the ostium, but, when it has reached this spot, to point nearly or quite in the axis of the Eustachian tube.

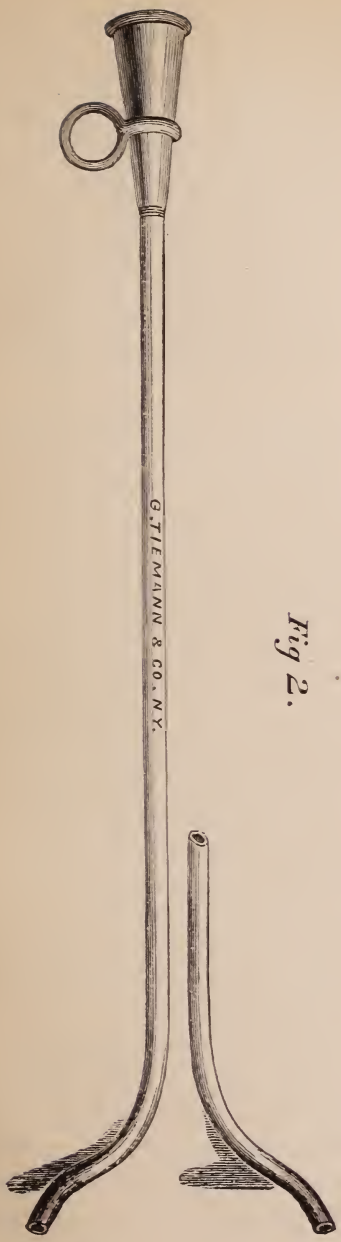


Fig 2.

The change needful is simply to give the beak a double curve. Take the elongated beak generally recommended, and, at three-eighths of an inch from the point, bend it in a plane transverse to the plane of the primary curve. This bend will always be upward when the catheter lies flat upon the floor of the nostril —but the same instrument will not serve for both sides, because the secondary curve is in opposite directions when used for the right or left sides. The Figure, 2, shows the form intended.

When introducing the catheter, it is needful to keep the point close to the septum as well as to the floor of the nostrils. Arrived at the posterior edge of the septum, the beak should wind closely around it—curving obliquely across and turning upward, so as to point toward the Eustachian orifice.

I am in the habit of always attaching the air-bag, by a piece of india-rubber tube about one foot long, to the catheter, because in forcing in air I

may do it vigorously, without disturbing the catheter and inflicting pain. After, by one or two puffs, it is perceived by the otoscope that the catheter is engaged in the tube, it may be pushed up a little farther by the thumb and forefinger tilting up the point. It is better always to use the left hand for the left Eustachian tube, and the right hand for the right. If any other fluid than air is to be introduced, the rubber tube may be slipped off, and one may, if desirable, afterward blow in with the mouth. The ordinary catheter, which I find to be more easily inserted when its beak is short, may be pushed farther into the tube by lifting its point by the thumb and forefinger in the same way.

I have satisfied myself that, for use by the opposite nostril, the double curve which I have described greatly facilitates the employment of the catheter, and renders it scarcely more troublesome, either to the patient or the surgeon, than is the usual instrument employed in the corresponding nostril. It is a cardinal principle in all these manipulations, as is the case with the urethral catheter, to abstain absolutely from using force. The instrument must glide along, and, as it were, find its own way, even being allowed to rotate as it enters, providing there be a natural inclination to do so. I find it better not to push the point back to the pharynx and then draw forward, but rather to aim at once for the ostium when the mark on the straight portion of the instrument shows that the beak is near its destination. I always inspect the nostril with speculum and mirror before putting in the catheter, so as to learn the peculiarities of the passage; and it is advisable to dip the end of the catheter in glycerine to lubricate it. I always give the patient the usual directions about holding the mouth a little open, to aid relaxation of the soft palate.

I consider it an important matter in aural therapeutics to make the Eustachian catheter an instrument of easy employment, for it is a vehicle of medication which nothing else can supplant. The other two proceedings for introducing air into the middle ear are eminently useful, and sometimes sufficient; but for accurate, vigorous, and reliable medication, the catheter must be taken in hand.

It does not come within my purpose, and it would be superfluous, to discuss modes of medication by the catheter, but my present testimony on behalf of its value is the fruit of experience, which has led me to adopt views contrary to those which were in vogue among English and American aurists ten or fifteen years ago.

CONGENITAL ONE-SIDED BONY CLOSURE OF THE EXTERNAL AUDITORY CANAL, WITH RUDIMENTARY DEVELOPMENT OF THE AURICLE.

By H. Knapp, M. D., of New York.

Cases of insufficient development of the organ of hearing are, as far as my experience goes, not at all frequent. Absence or rudimentary formation of the auricle and closure of the meatus externus seem to be combined, in the majority of cases, with rudimentary formation or absence of the inner ear, I mean the nervous apparatus within the labyrinth. A merely cutaneous or cartilaginous closure may, however, exist together with contraction of the osseous wall of the meatus externus. In such cases the restoration of the opening of the canal with the knife, and the subsequent dilatation of the narrowed meatus, may give the patient useful hearing. The case I beg to report here belonged to the first group. It was a healthy child of three months, whose left auricle consisted only of a slightly tortuous ridge, two lines in height and three-quarters of an inch in length. It felt tough to the touch, like a healthy auricle, being undoubtedly composed of cartilage and skin. Its shape represented the rudiments of the helix and lobule; the other parts of the auricle were not visible. Immediately before the middle of the rudimentary auricle, there was a small round depression, indicating the situation of the external meatus. Although its bottom felt hard, when a probe was pressed on it, I was not fully convinced that there was not merely a cartilaginous closure; I therefore thought an incision through the skin with a scalpel would be justifiable,

in order to ascertain the true nature of the occluding substance. I made the incision deep enough to satisfy myself, by the grating of the instrument and the impossibility of carrying it beyond the skin, that the canal was closed by hard bone, or rather that there existed no canal at all. The little wound healed without an unpleasant symptom.

The incurable condition of the case being demonstrated, and the child being too young to admit of inquiring into the existence of a labyrinth on that side, by testing the conduction of sound through the cranial bones, I dismissed the patient, thinking that his case could have no other interest than to contribute to the statistics of congenital malformations and arrests of development of the organ of hearing.

HEMIPLEGIA OCCURRING IN COINCIDENCE WITH CHRONIC SUPPURATION OF THE MIDDLE EAR. —By D. B. St. John Roosa, M. D., of New York.

I present the following cases of hemiplegia, with a full appreciation of the fact that they by no means prove that the paralysis was due to the affection of the ear; in both instances it may have been a mere coincidence. In one, that of the boy, the subsequent history renders this probable. It is easy to conceive, however, although the standard authorities, such as Wilde, Toynbee, Tröltsch, Moos, and Gruber, make no especial allusion to the subject, so far as I have been able to find, that a blood-clot might readily form between the dura mater and the bone, from rupture of a branch of the middle meningeal in the existence of caries of the temporal bone—and hemiplegia be induced by pressure communicated to the motor tract, or, as Mr. Hutchinson says, as quoted by Hughlings Jackson,[1] by squeezing the blood from the corpus striatum or thalamus opticus.

I have desired, therefore, to put these two cases on record, in order that future investigation may confirm or disprove the hypothesis that the hæmorrhage was caused by injury to a blood-vessel from a spicula of dead bone.

The first case is that of a boy, aged ten, whom his mother brought to me May 10, 1869, on the advice of Dr. H. D. Bulkley. He had had a discharge from the left ear since he was an infant, and, about four weeks before, he was affected with a number of symptoms, which seemed to come on gradually. He became unable to speak distinctly, to swallow his food properly, and finally to walk steadily. On examination,

[1] Reynolds's System of Medicine, vol. ii., p. 505.

it is found that there is partial paralysis of the left orbicularis of the muscles of the left side of the face, and of the *left* arm and leg, so that he cannot grasp well, and he drags his foot in walking. As has been said, these symptoms came on somewhat gradually, in the course of some hours, a fact which indicates hæmorrhage between the dura mater and the bone.

The right membrana tympani is intact, but it is thickened, and there is no light spot.

The left is ulcerated, and perforated. What remains of it is very vascular. He does not hear at all from the right ear, and he hears an ordinary-ticking watch, which should be heard three feet, seven inches from the left. Under the usual treatment for the suppuration of the left ear, the membrana tympani healed in two months, and the hearing power became normal. The paralysis was slowly being removed, so that he could nearly close his eye, could swallow, grasp, and walk better.

June 8, 1870, the patient was again brought to me. His hearing remains as above stated. The paralysis is completely recovered from, but his mother states that, in April, he was attacked with dizziness and loss of sight, while at school. He became so affected that he was fifteen minutes in going two or three blocks, and he was stupid when he reached home, although having complete control of all his limbs. He complained of its being dark, and he could not read, although he could go about. His vision was about one-fifth on the right eye, and one-fourth on the left, when brought to me two months after the attack. The field of vision is greatly limited on the periphery. I was unable to detect any lesion on a careful examination with the ophthalmoscope; no trace of hæmorrhage. I have seen him twice since, and his vision is improving.

The second case is that of a farmer, aged sixty-two, whom I saw once in consultation with Dr. Losee, in October last, at his home in Red Hook, N. Y. He had suffered from suppuration of the right ear since he was a child. Occasionally acute attacks would occur, culminating in the form of abscesses in the mastoid region. For the past six years, however, the ear had been very quiet, no painful exacerbations having occurred. About six weeks before I saw him he was seized with a pa-

ralysis of the arm and leg of the left side of the body, which came on completely, so that he was unable to move that side of the body in a few hours after the first symptoms. When I saw him, however, he was sitting up and beginning to move the affected side a very little. The hearing-power was completely gone on the right side. The membrana tympani and ossicula were absent. There was a cartilaginous band stretched across the outer portion of the canal. There was no tenderness in or about the mastoid. I divided this band, and found it to contain scales of bone, which seemed to come from the posterior portion of the canal. I injected the middle ear with air, by means of the catheter and Politzer, and removed from the bottom of the canal some inspissated pus and mucus.

The only treatment that I advised was the use of Politzer's method, in connection with thorough and regular cleaning of the ear, and general hygienic measures. I have heard since that the patient is going about.

It is somewhat remarkable that in one of these cases the paralysis was on the same side with the ulcerated ear. As is well known, there are exeptions to the rule that the hemiplegia is on the opposite side of the seat of the hæmorrhage. Whether, in cases of apoplectica meningea, the paralysis is more apt to be on the same side than in case of hæmorrhage into the cerebral substance, is a point upon which I cannot give an opinion.

UNUNITED FRACTURE OF THE LONG PROCESS OF THE MALLEUS, By R. F. Weir, M. D.

Although this unique case is alluded to in Roosa's translation of Tröltsch's work on the Ear, yet I beg leave to present it to the consideration of the Society more in detail than heretofore:

A man (Jeremiah Driscoll), aged thirty-two years, came to my clinique at the New York Eye and Ear Infirmary, May 11, 1867, with the history that, about four months previously, while going toward the yard-privy at night-time, he had fallen into an open area-way, a distance of about fifteen feet. The accident rendered him unconscious for nearly sixteen hours, and he was informed afterward that bleeding had occurred from the right ear and continued for about an hour. The quantity that escaped was not known. Upon his return to consciousness he felt a severe pain running from the right ear across the forehead to the other ear. This pain lasted for nearly a month, gradually diminishing, but the great tinnitus which also dates from the injury has continued unabated. He does not recollect any thing running into his ear, nor was there any laceration of the meatus visible to his friends. On the right side the watch was only heard when pressed firmly against the meatus; on the left side the hearing distance was normal.

On inspection, the drum membrane was normal in color, but the eye was immediately caught by a strange irregularity in the long process of the malleus. This bone was in reality fractured a short distance below the short process, presenting

the appearance shown in the diagram. The broken ends of the bone were completely and transversely displaced.

Fig 1.

Fig 2.

Upon directing him to perform the Valsalvan experiment, the fragments became apposed, and the line of continuity apparently reëstablished; but the posterior portion of the membrana tympani projected unduly forward, from loss of support. After waiting a few minutes, the displacement recurred, with corresponding sinking of the posterior half of the drum. At the line of fracture was also seen a point of congestion. It was thought by my colleagues, Drs. Hackley and Simrock, that a faint, whitish line, posterior to the malleus, might be a cicatrix from a laceration of the drum membrane. As the patient failed to come again to the clinique for further examination, I regret that I am unable to give the case with more completeness than this.

OBSERVATIONS ON THE USE OF STEAM IN THE TREATMENT OF DISEASE OF THE MIDDLE EAR. By Charles Inslee Pardee, M. D., of New York.

Writers on acoustics acquaint us with the fact that the vibration of bodies is always in accordance with their molecular arrangement, and consequently any change in that condition, however slight, must modify their power of transmitting sound. They tell us, also, that in many substances such changes are easily induced. This is especially true in relation to stretched membranes, the membrana tympani and the membrane closing the foramen ovalis being examples that especially interest us. So easily are such changes induced in stretched membranes, that, in estimating their vibrating capacity and power of conducting sound, we may consider atmospheric influences, temperature, and especially their condition of moisture or of dryness.

So in the human ear, if the labyrinth be in a normal condition, and the agents through which the sound-waves are conducted, the membrana tympani, the ossicula auditus, and the membrane closing the foramen ovalis, be under influences which disturb their molecular arrangement, the perception of sound must correspond to their condition. The atmospheric air in the tympanic cavity, in itself, cannot well affect the condition of the membranes (provided it gets in at all), because uniformly it undergoes a certain preparation for the place in passing through the mouth, nares, pharynx, and Eustachian tubes; neither are we to expect any marked influence from changes in temperature, because, the membrana tympani being a protection from external influences, and the air which is in

the middle ear having undergone preparation that answers the express purpose, the temperature must be uniform.

But in the condition of moisture or of dryness of the tympanic cavity there is a liability to marked variations. In temporary disturbances, and in serious and chronic diseases, there are modifications in the secretions which markedly affect the vibrations of those membranes.

Now there are certain diseased conditions of the middle ear in which the lining mucous membrane is thickened, the membrana tympani thickened and usually somewhat sunken, in which the normal secretion of mucus is lessened or apparently absent, even, the Eustachian tubes sharing in the general thickening and dryness, perfectly pervious, and permitting the free movement of air through them—known as chronic aural catarrh of the variety called sclerosis. Tinnitus aurium is an irregular symptom of the disease, but often present and often distressing. Catheterization and inflation sometimes improve the hearing slightly; more often not at all, neither does it improve the tinnitus. The cases are discouraging.

It seems reasonable to infer that, in such cases, some application to the comparatively dry surfaces of the tympanic cavity which shall increase the amount of secretion, would prove a step in the right direction toward reëstablishing those conditions which are demanded by the laws of sound. Such an application is moist heat. Furthermore, it seems reasonable to expect, from the use of steam, some improvement in that distressing and obstinate symptom, tinnitus aurium (which is caused by irritation of the auditory nerve), because of the admitted therapeutic effect of moist heat, it being sedative.

Several cases, the most of them having come under observation in the practice of a friend of the writer, Dr. Roosa, at the Manhattan Eye and Ear Hospital, New York, and to whose courtesy he is indebted for the opportunity of treating them, and of noticing the results, seem to justify these conclusions, as follows:

October 2, 1869.—W. A., aged seventeen, came to the Eye and Ear Clinic in the medical department of the University of the City of New York, and desired relief from deafness, which, in the right ear, was first noticed three years previously, and had

commenced without apparent cause. In the left the deafness was more recent, and was due to suppurative inflammation of the middle ear, the discharge, however, having ceased.

The right membrana tympani was sunken and pale, and the watch was not heard at all. A similar condition existed on the left side, the watch being heard at a distance of one inch. He had tinnitus in both. The pharynx and nares were normal. The diagnosis by Dr. Roosa was chronic aural catarrh, and subsequently the writer, in whose care the case was placed for treatment, confirmed it.

From that date (October) until February 17, 1870, the case was treated twice a week by the catheter and inflation. His hearing improved to right four inches, and left eight inches, but his tinnitus was not materially modified.

February 17*th.*—Commenced the application of steam to the tympanic cavity; the patient to come to the Manhattan Eye and Ear Hospital three times a week for the operation.

March 18*th.*—Under the above treatment his hearing had increased to *right twelve inches*, and *left fifteen inches*, and the *tinnitus had entirely ceased.* The treatment was continued for a little time longer, without any further results; but three months subsequently (in June) the patient was examined, and it was ascertained that so far the improvement had been permanent.

The case is one of a class that are most discouraging, both on account of the obstinate deafness and the (if possible) more obstinate tinnitus which so often accompanies them. All the improvement that ever was apparent from the use of the catheter and inflation occurred within three or four weeks after the commencement of treatment. The case remained in *statu quo* during about three months, while still under treatment, and then, what seems worthy of especial remark, under the steam, the hearing immediately improved, and the tinnitus within a short time ceased. Now it seems reasonable to infer that the steam, by reëstablishing the secretions in the abnormally dry tympanic cavity, placed the stretched membranes under more favorable acoustic conditions, and thus improved the hearing, while through its sedative effect the irritated auditory nerve became quiet.

Case.—K. P., aged eighteen, came under observation October 29, 1869. Her disease was chronic aural catarrh, sclerosis, and tinnitus in both ears. Until March 26, 1870, the case was treated by catheterization and inflation, being somewhat benefited thereby.

At that date she could hear right, twelve inches, and left, fifteen inches, while the tinnitus continued without modification. From March 26th to June 1st the treatment was irregular.

June 1st.—Steam was commenced, and systematically applied three times a week, until July 1st, when the hearing of the right ear was fifteen inches, and left eighteen inches—the tinnitus having almost ceased.

Case.—J. B., aged fifty-five; was first seen January 4, 1870. His disease was the same; chronic aural catarrh, of the form known as sclerosis, and he had tinnitus. With the right ear, the watch was heard, pressed against the auricle, and the left not at all.

At once an application of steam was made to the tympanum, and at regular intervals repeated until January 20th, when he heard on the left side fifteen inches, the right pressed, and the tinnitus had nearly ceased.

Case.—*January* 8, 1870.—C. R., aged eighteen. Her disease was chronic aural catarrh; sclerosis of more than two years' standing, and there was very severe tinnitus. On the right side she heard the watch eight inches, on the left four inches. Steam was applied to the tympanum, and repeated three times a week, until February 9th, when her hearing had increased to eighteen inches on the right, and on the left to twenty-four inches, and the tinnitus had entirely ceased.

Case.—*January* 12, 1870.—B. O'C., aged thirty-five, chronic aural catarrh; sclerosis of more than seven years' standing, and accompanied by severe tinnitus. On the right she heard the watch when pressed against the auricle, on the left two inches. Until January 20th she was under treatment by steam, the applications being made three times a week. At that date her hearing on the right side was six inches, on the left two inches, and the tinnitus very much better.

Case.—G. F., aged forty-five, came under observation

February 1, 1870. A most unpromising case of sclerosis of mucous membrane of the middle ear, accompanied by tinnitus, which was so excessive that it elicited most earnest pleading for relief. The disease had existed for more than six years. On the right side he did not hear the watch, but the voice when it was considerably elevated, and the speaker's mouth approached close to his auricle. On the left side he heard neither the watch nor the voice. He was treated by regular applications of steam to the tympanic cavity.

March 31*st.*—He was able to hear the watch when pressed against the right ear, and there was no tinnitus. By the aid of a hearing-trumpet he was enabled to hear the voice on the left side, and there was but little tinnitus.

Summary of Results.

Case.	Hearing.		Tinnitus.		Time of Treatment by Steam.	Durati'n of Disease.
	Right.	Left.	Right.	Left.		
1...	improved, 8 in.	improved, 7 in.	ceased.	ceased.	29 days.	3 years.
2...	improved, 3 in.	improved, 3 in.	much improved.	much improved.	30 days.	....
3...	no improvem't.	improved, 15 in.	nearly ceased.	nearly ceased.	16 days.	....
4...	improved, 10 in.	improved, 20 in.	ceased.	ceased.	31 days.	2 years.
5...	improved, 6 in.	no improvem't.	improved.	improved.	8 days.	7 years.
6...	improved.	improved.	ceased.	much improved.	2 months.	6 years.

The practical lesson which we may deduce from the foregoing is that, in the treatment of diseases of the tympanic cavity, its condition of moisture or of dryness should be considered, on account of its relation to the acoustic requirements of the hearing apparatus; and, when dryness exists, our therapeutic efforts should tend to reëstablish the normal secretion, while, on the contrary, astringent remedial agents are proper only when there is hyper-secretion.

The instruments required for the application of steam to the tympanic cavity are: 1. An apparatus for generating it. An ordinary glass flask which holds a quart will do very well. Two tubes thould be passed through the cork, and on the external end of each a piece of flexible rubber tubing (about

eighteen inches in length is convenient) be placed. Steam can be generated in a glass flask very well, without the sand-bath, even, provided care is used in first applying the heat. In the free end of one rubber tube must be placed a nozzle of rubber or of glass, and small enough to fit into a Eustachian catheter; in the other tube the nozzle of a Politzer's air-bag. Pressure on the air-bag will force the vaporous contents of the flask through the small nozzle of the other pipe. 2. A Eustachian catheter and a catheter-holder. The catheter should be of rubber, because the heat from the steam soon renders a metallic instrument unpleasantly warm for the nasal passages. Any of the approved catheter-holders may be used, although the best is the one invented by Dr. O. D. Pomeroy, of New York.

The catheter should be placed in the mouth of the Eustachian tube, and retained in position by the catheter-holder, then the small nozzle of the steam apparatus being in the outer end of the catheter, steam can be forced to the middle ear by sharp pressure on the air-bag. If the pressure on the air-bag is slow, the prolonged contact of the steam is likely to be unpleasantly felt by the patient, and there is some danger that it may escape into the pharynx and provoke inflammation there. On the other hand, if it be applied by sudden, sharp pressure, and the nozzle removed from the catheter after each puff, no inconvenience is ever felt, and there is no possible danger of exciting inflammatory action in the pharynx.

OBSERVATIONS UPON THE PHYSIOLOGY OF THE EUSTACHIAN TUBE, MADE DURING A SHORT EXPOSURE TO AN ATMOSPHERIC PRESSURE OF SIXTY POUNDS TO THE SQUARE INCH.—By John Green, M. D., of St. Louis, Missouri.

During the past winter and spring two bridge-piers have been sunk to the rock underlying the bed of the Mississippi River at St. Louis. The work has been performed by a method known to engineers as the *plenum pneumatic*, necessitating the excavation of the sand by men working in an air-chamber, under an atmospheric pressure increasing with the depth below the surface of the water, and equalling at one time, during high water, at the eastern pier, no less than four atmospheres, or sixty pounds to the square inch.

The entrance to the chamber of condensed air was through an "air-lock," or small chamber into which the condensed air could be admitted gradually, occupying, for the higher degrees of pressure, from five to ten minutes. The exit was through the same lock, and occupied about the same time.

The temperature within the air-chamber was that of the external air, increased somewhat by the animal heat of the workmen and by the burning of candles. The increased oxidizing power of the condensed air was shown by the rapid wasting and guttering of the candles, which burned with a streaming, smoky flame, and by the fact that a candle, when blown out, rekindled spontaneously from the glowing wick. The processes of oxidation and waste of tissue within the body seemed also to be considerably augmented; during the earlier stages of the work, corresponding to a pressure of two or two

and a half atmospheres, the workmen remained in the air-chamber six hours at a time, and often worked twelve hours out of the twenty-four; but, as the pressure increased, the time of labor had to be shortened, until at last it was reduced to an hour, alternating with three hours of rest. During the last stages of the work, at the greatest depth, a remarkable form of paraplegia broke out among the laborers, and was even observed in several cases of persons casually visiting the works. Nearly all the workmen suffered in some degree from cramps, a large number were paralyzed, some (at least a dozen) died. A sketch of the symptoms, with notes on pathological changes discovered in the central nervous system, and especially in the lumbar portion of the spinal cord, has been published by Prof. Louis Bauer in the *St. Louis Medical and Surgical Journal* for May, 1870.

The exit from the air-chamber, through the lock, was attended by a marked reduction of temperature, amounting to ten or twelve degrees when but one or two persons were in the lock; with six or eight persons crowding the lock, the change in temperature was hardly noticed, except when the condensed air was allowed to escape very rapidly. The sudden chilling of the surface of the body from this cause gave rise to frequent catarrhs, both among the more careless workmen and visitors who were not forewarned of the danger.

A visit to the air-chamber, a short time before the completion of the work at the eastern pier, afforded the opportunity of making a few observations, meagre in themselves, but suggesting a line of experiment which may possibly be carried out at a future time, when the state of the works shall permit another visit.

The time occupied in passing the lock was ten minutes, corresponding to a tolerably uniform increase of pressure of about one and a fifth ounce to the square inch for each second of time.

Three or four seconds, corresponding to about as many ounces of pressure to the square inch, sufficed to produce a distinct sensation of tension upon the tympanic membranes in both ears, which in a few seconds more became somewhat painful. This sense of tension was instantly and perfectly re-

lieved by the experiment of Valsalva, by the act of swallowing, or by a voluntary action of the palatine and pharyngeal muscles, by which the writer is able to open the Eustachian tubes and hold them open for a considerable time. A few seconds sufficed to reproduce the sensation of pressure, necessitating the repetition of the relieving act. All three methods were effective, but the difficulty of frequently swallowing without eating or drinking, and a want of aptitude in holding the tubes continuously open, resulted in a decided preference for the method by inflation.

When once within the air-chamber the sensation was in no respect peculiar. Respiration and the heart's action became, however, somewhat accelerated upon comparatively slight exertion. The novelty of the situation, the desire to inspect the principal features of the work, the want of special preparation for the visit, and above all the noise made by twenty men shovelling and ramming concrete, made it extremely difficult to try any acoustic experiments, and must explain the meagreness of the observations in this respect.

A metallic percussion sound, the ticking of a watch, was, notwithstanding the noise, heard with great distinctness, and was apparently much louder than under the usual atmospheric pressure.

The voice seemed changed in timbre, but not remarkably in power. It required an unusual effort to keep up a conversation, but this was due in part at least to the sounds made by the tools of the workmen.

The most remarkable phenomenon, and one constantly observed, was the extreme difficulty (and, under the higher degrees of pressure, impossibility) of making an audible sound by the effort to whistle with the lips.

These observations suggest a series of comparative experiments with the tuning-fork, reeds, and pipes, which may be undertaken a few months hence.

In coming out of the air-chamber through the lock (the time occupied being about ten minutes), the only phenomenon connected with the tympanic apparatus was the spontaneous escape of the condensed air through the Eustachian tubes. This occurred, not in a continuous current, but by a succes-

sion of little puffs, succeeding each other at intervals of fifteen or twenty seconds, independently of respiration, and absolutely without the concurrence of any muscular action. The whole phenomenon was in fact suggestive of the action of a lightly-resisting valve, necessitating a slight but perceptible increase of pressure within the tympanic cavity, to open the passage to the pharynx. This observation was made with great care, and is fully confirmed by intelligent persons who have been questioned upon the subject, although, previously to the visit which forms the subject of this communication, no other statement could be elicited than the bare fact that no unpleasant sensations were felt in the ears on coming out of the air-chamber.

The writer has had occasion to examine a considerable number of cases in which persons have suffered from affections of the ear, originating in visits to the air-chamber. These affections have been primarily of two kinds: 1. Rupture of the membrana tympani from external pressure in cases of impervious Eustachian tube, and perhaps also of persons not instructed in the methods for restoring the equilibrium of pressure. 2. Acute tubal or aural catarrh, attributable probably to the sudden reduction of temperature in the air-lock.

The cases of rupture occurred most frequently in persons visiting the air-chamber for the first time; in other cases, however, the accident was evidently due to an acute tubal catarrh developed during the interval of a few hours, between two periods of labor. Only one case of rupture was seen immediately after the injury; it presented the appearance of a nearly vertical slit about two lines in length, in the posterior portion of the membrane; about a drop of coagulated blood was found in the external meatus. Two or three cases of purulent otitis media were treated in which the history pointed clearly to a rupture, followed by pain, discharge, etc. In one case, of several weeks' standing, there was a polypoid growth protruding through the perforated membrane. The polypus rapidly retreated under the careful use of solid chromic acid, applied upon the end of a fine probe; the perforation healed.

There was nothing peculiar in the cases of simple catarrh;

some of them were quite mild, others rather severe; all did well under the usual methods of treatment.

It is currently reported, upon sufficiently trustworthy authority, that several cases of partial deafness have been cured by a visit to the air-chamber. Such an exposure acts, of course, as a powerful air-bath, and may sometimes suffice to overcome a tubal adhesion. It is certainly not to be commended as a plan of treatment.

In a few cases severe pain has been felt in the region of the frontal sinuses, on first entering the air-chamber. This may be explained by supposing an obstruction from swelling of the walls of the passage from the sinus to the middle meatus of the nostril. The excess of pressure upon the surface and in the open cavities of the body over that in the closed sinus, would doubtless lead to a speedy effusion of blood or serum within that cavity, giving rise probably to a secondary trouble from distention, when the external pressure is removed.

Hæmoptysis has also occurred, in one case, under the observation of the writer. The subject—the same in whom the recent rupture of the membrana tympani was observed—was a stranger visiting the works from motives of curiosity. He entered the lock under the guidance of a careless laborer, who admitted the condensed air so rapidly as to cause intense pain in the ears, ending in the rupture of one of the membranes. Frightened at this accident, he insisted upon being released, and the air was let off as rapidly as it had been admitted. The hæmoptysis occurred immediately upon his stepping out of the lock; it was not large, and continued but a short time.

TRANSACTIONS

OF THE

American Otological Society.

FOURTH ANNUAL MEETING.

NEWPORT, R. I., JULY 19 1871.

BOSTON:
ALFRED MUDGE & SON, PRINTERS, 34 SCHOOL STREET.
1871.

MEMBERS OF THE AMERICAN OTOLOGICAL SOCIETY.

Dr. Frank W. Abbott.....Buffalo, N. Y.
Dr. C. R. Agnew.....New York City.
Dr. Robt. M. Bertholet.....Phila., Pa.
Dr. C. J. Blake.....Boston, Mass.
Dr. A. H. Buck.....New York City.
Dr. John H. Dix.....Boston, Mass.
Dr. Samuel L. Frank.....Baltimore, Md.
Dr. John Green.....St. Louis, Mo.
Dr. J. Orne Green.....Boston, Mass.
Dr. Chas. E. Hackley.....New York City.
Dr. J. H. Hinton.....New York City.
Dr. E. L. Holmes.....Chicago, Ill.
Dr. H. Knapp.....New York City.
Dr. J. W. Lawton.....Syracuse, N. Y.
Dr. W. J. Ludlum.....New York City.
Dr. Arthur Mathewson.....Brooklyn, N. Y.
Dr. W. W. Morland.....Boston, Mass.
Dr. H. G. Newton.....Brooklyn, N. Y.
Dr. Henry D. Noyes.....New York City.
Dr. J. F. Noyes.....Detroit, Mich.
Dr. Chas. J. Pardee.....New York City.
Dr. Howard Pinkney.....New York City.
Dr. Geo. B. Pomeroy.....New York City.
Dr. O. D. Pomeroy.....New York City.
Dr. Thos. R. Pooley.....New York City.
Dr. J. S. Prout.....Brooklyn, N. Y.
Dr. C. E. Rider.....Rochester, N. Y.
Dr. C. A. Robertson.....Albany, N. Y.
Dr. D. B. St. J. Roosa.....New York City.
Dr. W. W. Seely.....Cincinnati, Ohio.
Dr. Samuel Sexton.....New York City.
Dr. H. L. Shaw.....Boston, Mass.
Dr. Francis Simrock.....New York City.
Dr. H. N. Spencer.....St. Louis, Mo.
Dr. R. F. Weir.....New York City.
Dr. Robt. Willard.....Boston, Mass.

THE AMERICAN OTOLOGICAL SOCIETY. MINUTES FOR 1871.

The Fourth Annual Meeting of the Society was held at the Ocean House, Newport, R. I., July 19, 1871, at 10 3-4 o'clock, A. M., the President, Dr. H. D. Noyes, in the chair.

Present: Drs. H. D. Noyes, of New York; O. D. Pomeroy, of New York; John Green, of St. Louis; H. G. Newton, of Brooklyn; C. J. Blake, of Boston; W. W. Morland, of Boston; J. Orne Green, of Boston.

The minutes of the last meeting were read and approved.

The President appointed Drs. J. Green, Pomeroy, Morland, Newton, and Blake as a Committee on the Nomination of New Members, Nomination of Officers, and as an Executive Committee. This Committee reported the nomination of the following gentlemen for membership: —

Drs. Samuel Sexton, of New York; R. M. Bertholet, of Philadelphia; Robert Willard, of Boston; George B. Pomeroy, of New York.

By a suspension of the by-laws these gentlemen were elected by a *vivâ-voce* vote, and Drs. Sexton and Bertholet took their seats as members.

The Treasurer's report was read and referred to an Auditing Committee composed of Drs. Morland and Pomeroy, who reported it correct.

The following bulletin of business was submitted to the Society, and as each paper was read, it was referred to the Publishing Committee: —

1. Report on the Progress of Otology. Dr. A. H. Buck, of New York.
2. Case of Horny Growth from the Auricle. Dr. A. H. Buck, of New York.

3. Necrosis of the Mastoid Cells in immediate neighborhood of Ext. Auditory Meatus. Dr. Charles Laight, of New York, through Dr. Buck.
4. A singular case of Nervous Deafness treated unsuccessfully by Galvanism. Dr. R. F. Weir, of New York.
5. Tumor of the Cavity of the Tympanum with Otitis Media Serosa. Dr. R. F. Weir, of New York.
6. Some cases of Polypus and their Treatment. Dr. W. W. Seely, of Cincinnati.
7. Exhibition of Anatomical and Microscopical Specimens. Dr. C. J. Blake, of Boston.
8. Case of Abscess of Cerebellum. Dr. W. W. Morland, of Boston.
9. A case of Reproduction of the Membrana Tympani. Dr. H. N. Spencer, of St. Louis.
10. On the Conclusions to be drawn from the Secretions in Chronic Purulent Inflammation. Dr. Charles J. Pardee, of New York.
11. Results of the Aural Examination of sixty lunatics. Dr. O. D. Pomeroy, of New York.
12. Investigations on Inflation. Dr. O. D. Pomeroy, of New York.
13. Fibrous Tumor of the Auricle, with Photograph. Dr. R. M. Bertholet, of Philadelphia.
14. On Atomizing Apparatus. Dr. H. D. Noyes, of New York.
15. Five cases of fatal Otorrhœa with remarks on the course by which such cases lead to death. Dr. J. Orne Green, of Boston.

A vote of thanks was given Dr. Blake, for the pleasure afforded the Society in examining his cases of specimens illustrating the minute osseous anatomy of the ear.

At 2 1-2 o'clock, after the reading of the eleventh paper, the Society adjourned till 5 1-2 o'clock, P. M.

Second Session.

The Society was called to order by the President at 5 1-2 o'clock, and the minutes of the first session were read and approved.

The resignation of Dr. H. L. Shaw as Corresponding Secretary was received, and, being understood to be absolute, was on motion accepted. It was moved and voted that the Committee on Nomination of Officers be instructed not to nominate a corresponding secretary.

The reading of the papers was then concluded.

It was voted that the rules in regard to assessments, the revision of proofs, and adjournment, be the same as adopted last year, viz. : —

That all papers referred to the Publishing Committee be sent to them before Oct. 1st, and that proofs of articles be sent to their authors, returnable within one week from the date of their receipt, in default of which return the paper to be left out of the Transactions at the discretion of the Committee :

That when the Society adjourn it should meet again on the call of the Secretary, the day previous to the annual meeting of the American Ophthalmological Society.

The Committee on the Nomination of Officers reported the following list : —

President, Dr. H. D. Noyes ;

Vice-President, Dr. E. L. Holmes ;

Secretary and Treasurer, Dr. J. Orne Green ;

Publishing Committee, { Dr. R. F. Weir, Dr. C. E. Hackley ;

Committee on Progress of Otology, Dr. C. J. Blake ;

All of whom were duly elected.

The minutes of this session were read and approved. The resignation of Dr. A. D. Williams as a member of the Society was reported by the Secretary and accepted by the Society.

Adjourned 7 1-2 p. m.

REPORT ON THE PROGRESS OF OTOLOGY. By Albert H. Buck, M. D., of New York City.

The records of the past year show that the different branches of the science of otology are steadily receiving new additions. It is especially pleasant to notice how large a proportion of these contributions emanate from American sources. Hitherto (that is to say, since the death of Toynbee) the Germans have almost monopolized the field. The past year, though, has been characterized by the increased interest taken by both the Americans and English in all matters pertaining to the ear.

In the department of anatomy, several valuable contributions have been made to our knowledge of the minute anatomy of the labyrinth, by Rüdinger[5], Winiwarter[7], Gottstein[8], and Boettcher[6]. Rüdinger and Eyssel[40] have determined by their investigations the mode of attachment of the base of the stirrup to the oval window. Both agree in the statement, that the base of the stirrup is covered by a layer of cartilage, and that the band (lig. stap. bas. annulare) which binds it to the surrounding margin of the oval window, is composed of fibrous tissue, rich in elastic elements, whose fibres run directly across the space, separating the edge of the stirrup from the margin of the window.

In the department of physiology, there is nothing specially new to chronicle. The third edition of *Helmholtz's Lehre von den Tonempfindungen*[42] has appeared during the past year. The part relating to the theory of the mechanism of the labyrinth has been somewhat modified by the discoveries of von Hensen and Hasse. Another valuable contribution to physiological acoustics, is the work of Oskar Wolf[2] — "Speech and the Ear." The author says that the study of

this subject was suggested to him by the experience that patients suffering with disease of the ear can hear certain sounds more distinctly than others. The first portion of the work is devoted to the acoustico-physiological part of the subject; namely, to analyze and define more precisely the elementary nature of the different sounds of human speech. In the second part (pathological) the author endeavors to characterize the peculiarities that belong to an abnormal ear. The third part is devoted to the physiology of the auditory apparatus.

The author tested the hearing of a person in whose left ear there was nothing abnormal to be detected beyond the existence of a small perforation in the lower half of the membrane. Out of 260 words selected for the purpose, only seven vowel sounds were incorrectly understood. Of the consonant sounds, *sch* was always heard correctly, while *F* was heard comparatively the worst; that is, incorrectly in 66% of the trials; the other consonants were heard between these extremes in the order in which they are given here: S, L, M, N, R, B, H, K, T, W. In a second case, where there was a much larger defect in the lower anterior quadrant of the left ear, the vowel sounds were heard nearly as well as in the first case; those vowels, however, which stood near together in pitch, were often mistaken the one for the other. The consonant sounds were heard in the following order of distinctness: S, Sch, L, N, M, T, F, B, K, H, R, W. The author follows out the same method of testing the hearing in various other lesions of the ear, but declares himself unable as yet to draw any practical conclusions from the experiments. A new road is here opened for investigation, which may in time lead to valuable discoveries.

In the department of pathological anatomy, we have several new and interesting contributions. The old question concerning the pathology of hæmatoma auris is revived again by Hun[43], Gudden[9], Ludw. Meyer[9], and Nichol[23]. Hun comes to the conclusion that this lesion is idiopathic, depending upon a pathological condition of the brain, and is incadu-

ble of being produced by external violence alone. The other writers came to the conclusion which Virchow expresses so clearly in his work on tumors. They believe that the othæmatoma is not one of the pathological lesions of insanity; but that the surroundings of the insane, and the debilitated condition which so frequently accompanies insanity, are the real reasons for its so frequent occurrence among that class of the community. Nichol concludes that the elements most probably constant among the antecedents of othæmatoma are a dyscrasia causally connected with general excitement and some external irritation; and that the latter factor is sufficiently supplied in almost every case by the unfavorable position of the ear during the hours of recumbency.

A remarkable case of deformities of the ears is reported by Mr. Moxhay of England[27]. In addition to the two perfect ears, on the right side, there were three rudimentary auricles, — one rather a perfect specimen, being divided into helix, anti-helix, tragus and anti-tragus, and a depression for the meatus. On the left side there were two of these abnormal growths, — one representing a fleshy lump with cartilage in and beneath its substance, just below and in front of the proper ear; the second being a mere projecting tubercle, but exhibiting when removed a cartilaginous meatus dipping deep. A congenital deficiency of the right ramus of the lower jaw also existed, which gave a singularly strange expression to the face, resembling somewhat the drawing down of the chin by the contraction of the cicatrices of burns.

If we pass on to the consideration of the diseases of the ear and their treatment, we find that the past year has been one of decided progress.

In tumors of the ear a case is reported of epithelioma involving the auricle[16]. The entire external ear was amputated, and at last accounts the disease had not returned.

Dr. Charles H. Burnett reports some cases of fibrous tumors of the auricle[30] occurring in negresses. He calls attention to the interesting fact that recidives are very fre-

quent after the operation for extirpation, and that the second growth, like the original tumor, is purely fibrous in its nature. Dr. Robert F. Weir, of New York, has had a very marked case of this kind during the past year. The patient was a girl, aged about twenty, in whom the operation for piercing the ears was followed on both sides by the growth of a hard, apparently fibrous tumor. These growths were twice removed by some other physician before the case came under Dr. Weir's observation. He removed the new growths, and submitted them to a microscopic examination. They proved to be composed of a very dense fibrous tissue, in which not a single cellular element could be detected. It is fair to presume that the two previous growths were of the same histological structure. A few months later the patient returned for the removal of a fourth recidive. The tumors originated, apparently, in the cicatrices of the previous opetion. The tendency to such formations was still further emphasized by the presence of two or three small round tumors in the cicatrices of the sutures. They were of the size of a small shot and occurred at intervals corresponding to the sutures used in sewing up the wound.

Dr. Blake[17] reports two cases of larvæ in the ear. They caused considerable trouble during their stay, but were readily removed, and left no unpleasant after-symptoms.

Dr. Green[15] reports a very interesting case of restoration of the membrana tympani after its almost complete destruction from chronic inflammation. A better example could scarcely be furnished in proof of the falsity of the belief prevalent among physicians, that perforations of the membrana tympani do not heal. In this case almost the entire membrane had been destroyed. During the process of restoration the new membrane could be observed growing, if I may so term it, concentrically. As it progressed the perforation grew smaller and smaller, and finally closed up entirely. In the new cicatricial tissue the radial fibres could be distinctly recognized, showing clearly that the substantia propria had been regenerated, though perhaps only to a limited degree. In many cases of cicatricia

closure of a perforation, the newly formed membrane appears to be composed exclusively of the dermoid and mucous layers of the membrana tympani, with perhaps a very thin, structureless membrane intervening. Whether these newly formed membranes always contain some elements belonging to the substantia propria, or whether they are only present under certain circumstances, is a difficult question to answer, as it is rare that we get the opportunity of examining these cicatrices under the microscope. The present case adds its evidence to the truth established by Politzer and others, that the *substantia propria* often is regenerated.

The use of absolute alcohol in obstinate cases of purulent inflammation of the middle ear, has been revived during the past year by Dr. F. E. Weber[13], of Berlin. He claims for it a remarkable degree of success, and states that he has rarely found its application painful to the patient. It is hardly time yet to pass judgment on this lately-revived, and perhaps valuable remedy in otorrhœa. It has been tried pretty faithfully at the New York Eye and Ear Infirmary during the past two months, but not with the satisfactory results claimed for it by Weber. The same author recommends the administration of oleum terebinthinæ[39] internally, to check acute inflammation of the tympanum, and says he has found it a very efficient remedy.

Another mode of treating chronic purulent inflammation of the middle ear, is one whose essential feature consists in a very thorough cleansing of the cavity of the tympanum. One plan is to pass a stream of luke-warm water from the pharyngeal end of the Eustachian tube through the middle ear, and out through the perforation of the membrana tympani into the external meatus. E. Van Millingen, Politzer's assistant, was the first, I believe, to carry out this treatment. Lucae, in Berlin, had previously inaugurated the plan of using a double tube in cleansing the tympanum. The two tubes were firmly fixed in a perforated rubber cork, and when tightly fitted in the meatus, he forced the water through one tube into the tympanum, and out through the second tube.

This method of cleansing the ear, Lucae claimed to be more efficient than the ordinary method of syringing. Van Millingen's method, if the Eustachian tube is free and of good caliber, is probably more effective than either of the other two. A third plan — recommended by Hinton[29], of London — consists in passing a continuous stream of water from the external meatus into the tympanum, and so out through the Eustachian tube and nostril. This can be accomplished in most cases by covering the nozzle of the syringe with rubber tubing, so as to make it fit air-tight in the external meatus. Hinton's plan is to repeat the cleansing for several days, until the fluid that escapes from the nostril is quite clear. If necessary he adds a little bicarbonate of soda to the water (℈ — ℥i.). When the tympanum and mastoid cells are cleared of their mucus, pus, or whatever foreign material may be lodged there, he passes a stream of some mild, astringent solution (alum, gr. v-xx. ad ℥i.) through the tympanum in the same way as he did the water. Hinton claims excellent results for this method, and certainly it seems to be a most rational mode of treatment; in fact the only one, where a thorough application of the remedial agent can be counted on.

During the past year four new[24 28 32] cases have been published where the operation of trephining the mastoid process was performed with the best of results. In one of these cases the patient was a child six years old ; in all the others, the patients were adults. In the case of the child, the symptoms which decided the question of an operation in the mind of the surgeon were simply these: great pain in the region of the ear, redness and tenderness over the mastoid process, together with a thick discharge from the meatus. These symptoms alone, judging from the brief history of the case, as reported, were thought sufficient to justify the operation. A T-shaped incision was made over the mastoid process; a spot was found that was somewhat softened, and here the perforation was made with the drill. Dark pus came from the opening, and several pieces of necrosed bone were

removed. At the end of thirty-six days the patient was entirely well. In a second case, there had been a slight discharge from the left ear for a period of six weeks. On admission, the patient was suffering from severe pain in the left ear, and over the left side of the head. The skin over the mastoid process was red, tumid, and very tender; the left side of the pharynx was similarly affected. The operation was performed as in the preceding case. Pus was reached, and some fragments of necrosed bone were removed. Twenty-four days afterwards the patient was entirely well. In both of these cases the results fully justified the operation. According to the present views and teachings of otologists, the existence of necrosed bone was scarcely enough indicated to justify the operation of trephining the mastoid process. In all probability milder means would have been used, such as leeches, a free deep incision over the bone, and cataplasms. It is possible that other symptoms existed in the case which do not appear in the printed report, and that these influenced the operator in his decision. However this may be, the operations were eminently successful. Their success naturally suggests the thought whether the prevailing conservatism in regard to the operation is not in many instances, prejudicial to our patients.

In the other two cases the indications for trephining the process were very clear. As in the previous cases the operation proved remarkably successful. In one of these, where the brain symptoms were marked, an ounce of pus was evacuated through the opening made by the trephine. A director was passed into the opening for a distance of at least two inches without meeting any resistance. At the bottom of the track the dura mater could be seen pulsating. Four months later the fistulous opening had closed, and the patient has remained well since.

Politzer[18] reports a curious case of chronic spasm of the muscles of the Eustachian tube, that occurred in a girl twelve years old. It had existed five years, and produced an almost rhythmical ticking sound in the left ear, audible not only to

the patient, but also to others. On inspection, a convulsive twitching of the left arch of the palate was observed to occur isochronously with the ticking sound. A manometer was placed air-tight in the external meatus, but no change could be observed in the level of the fluid in the upright arm of the tube, showing that the noise was not due to a spasm of the tensor tympani muscle. The disease was cured in a short time by the use of Faradic electricity.

F. E. Weber[39], of Berlin, reports a case of very obstinate and annoying tinnitus aurium, cured by division of the tendon of the tenson tympani muscle. The use of Politzer's air douche had no effect on the noises. Excision of part of the membrane was of no service. The noises, however, ceased almost immediately after the division of the tendon. To prevent union between the two divided ends, the air douche was used frequently after the operation. At the end of two months the patient wrote that the noises only troubled her at times, and then it was always due to some special exciting cause. This operation, it is to be hoped, will afford us another remedy for that most terrible of afflictions — tinnitus aurium.

BIBLIOGRAPHY FOR 1870–71.

[1] Zur Physiologie des Schallleitungs - Apparates, by Prof. Dr. Adam Politzer. Wiener Med. Wochenshrift, May 27, 1871.

[2] Sprache und Ohr — by Oskar Wolf — Vieweg and Sohn, publishers, Braunschweig, 1871.

[3] Beiträge zur Pathologischen Anatomie des Ohres, by Hermann Wendt. Archiv. der Heilkunde, 11 Jahrgang, 6th Heft, page 562. (Cases of cerebral abscess, thrombosis of the sinus, and meningitis in ear patients).

[4] Beiträge zur Anatomie und Histologie des Mittleren Ohres, by G. Brunner. Wilhelm Engelmann, publisher. Leipzig.

[5] Beiträge zur Histologie des Gehörorganes, by Rüdinger. Munich, 1871.

[6] Ueber Entwickelung und Bau des Gehörlabyrinths, nach Untersuchungen an Säugethieren, by Arthur Boettcher. Wilhelm Engelmann, Leipzig, 1871.

[7] Untersuchungen über die Gehörschnecke der Säugethiere, by A. von Winiwarter.

[8] Beiträge zum Feineren Bau der Gehörschnecke, by J. Gottstein. Med. Centralblatt. No. 40.

[9] Ueber den Mikroskopischen Befund in traumatisch gesprengten Ohrknorpel, by Gudden and Ludwig Meyer. Virchow's Archives — 1870. LI. 4, page 157; 1871. LII. 2. page 303.

[10] Gerichtsärztliche Würdigung der Laesionen des Gehörorganes durch Schlag, by Hassenstein. Berlin. Klin. Wochenschrift. VIII. 9. 1871.

[11] Report of aural clinic of Dr. James Collins — cases of chronic aural catarrh. Philadelphia Med. and Surg. Reporter, May 13, 1871.

[12] Paracentesis Tympani, by W. H. Fitch, M. D. Chicago Med. Examiner, Feb. 1871. (A case of serous accumulation in the tympanum, cured by paracentesis of the membrana tympani, and astringent applications to naso-pharyngeal mucous membrane.)

[13] Spiritus Vini Rectificatissimus bei chronischen Otorrhöen, by Fr. Eugen Weber. Berlin. Klin. Wochenschrift, VIII. 2. 1871.

[14] Ueber die Operation der Paracëntese des Trommelfells, by Zaufal. Wiener Med. Wochenschrift. XXI. 8. 1871.

[15] Restoration of the membrana tympani after its almost complete destruction from chronic inflammation, by J. Orne Greene, Jr., M D. Boston Med. and Surg. Journal, Nov. 24, 1870.

[16] Report of a case of epithelioma of the the ear; amputation; recovery. Ib d .Feb. 16, 1871.

[17] Two cases of larvæ in the ear, reported by Dr. C. J. Blake. Ibid. March 9, 1871.

[18] A case of clonic spasm of the muscles of the Eustachian tube, by Prof. Adam Politzer. American Journal of Med. Sciences, Jan. 1871. (From Centralblatt für die Med. Wissenschaften.)

[19] Report on Otology, by Samuel J. Jones, M.D. Chicago Med. Examiner, Oct. 1870.

[20] A statistical report of diseases of the ear, by E. L. Holmes, M.D., Prof. of Ophthalm. and Otology, Rush Med. College. Chicago Med. Journal, Sept. 1870.

[21] Ueber totale Taubheit bei Kindern, in Folge von Erkrankung des Centralnervensystems, by Julius Böke. Wiener Med. Presse. XII. 6–8, 1871.

[22] Phlebitis of sinus from middle ear trouble, by Dr. Stokes. Dublin Med. Journal, Aug. 1870.

[23] Othæmatomata, by Dr. Nichol. British and Foreign Medico-Chirurgical Review, July, 1870.

[24] A case of trephining the mastoid process, by W. Colles. Dublin Quart. Journal of Med. Science, Aug. 1870.

[25] Lectures on Aural Catarrh; or the commonest forms of deafness, and their cure, by Peter Allen. London, 1871.

[26] Caries of the temporal bone. by Dr. Bennett. Dublin Quart. Journal of Med. Science. Feb. 1871.

[27] Remarkable deformities of the ears and face, in a young girl, by Mr. Moxhay, of Reading. British Med. Journal, Nov. 12, 1870.

[28] Intracranial abscess from disease of the mastoid cells, cured by operation, by Frank Buszard, M.D. British Med. Journal, Jan. 28, 1871.

[29] On the treatment of perforations of the membrana tympani, by James Hinton. Guy's Hosp. Reports. Series III, Vol. XVI. 1870-71.

[30] Fibrous tumors of the auricle, by Dr. Chas. H. Burnett. Report of proceedings of Path. Society of Philadelphia. Amer. Journal of the Med. Sciences, Jan. 1871.

[31] Statistical report of 494 cases of diseases of the ear, by D. B. St. John Roosa, M.D. Ibid. April, 1871.

[32] Two cases of abscess in the mastoid process; perforation of the bone, by Mr. Barwell. The Lancet, London, April 29, 1871.

[33] Cicatrices of the membrana tympani, by Prof. Adam Politzer. Reported by Mr. E. Millingen. Med. Times and Gazette, March 4, 1871.

[34] Description of a nose-pad, to be used instead of a tube, with Politzer's air bag. by Dr. Peter Allen. Ibid. March 4. 1871.

[35] On the accumulation of serum in the tympanic cavity. Diagnosis and treatment, by Mr. Edwin Millingen. Ibid. March 25, 1871.

[36] L'action anatomique, physiologique, thérapeutique des irrigations d'eau tiède sur la membrane du tympan, by M. le doct. Prat. Bulletin de l'Académie Impériale de Médecine. Tome XXXV. No. 11, page 500.

[37] Fatal arterial hemorrhage from the ear, as a sequel of scarlet fever. The Lancet, London, Sept. 24, 1870.

[38] The nasal douche in the treatment of naso-pharyngeal catarrh, with report of a case of rupture of the drum of the right ear, by Wm. H. Doughty, M.D. Richmond and Louisville Med. Journal, Feb. 1871.

[39] Monatschrift für Ohrenheilkunde. Berlin.

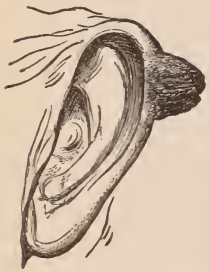
[40] Archiv für Ohrenheilkunde. Würzburg.

[41] Archives of Ophthalmology and Otology, Heidelberg and New York.

[42] Die Lehre von den Tonempfindungen, by H. Helmholtz. Leipzig, 1870.

[43] Haematoma Auris, by E. R. Hun, M.D. Albany. (American Journal of Insanity for July, 1870.)

A CASE OF CORNU HUMANUM OF EXTERNAL EAR. By Albert H. Buck, M. D., of New York City.



In January, 1871, Mr. H., aged 55, consulted me in reference to a horny growth on the top of his left ear. He stated that nearly two years before, he first noticed a small sharp point on the top of the ear. He picked it constantly with his nails, until it became sore. At the same time what he supposed to be the scab grew to be quite thick, hard, and prominent. Whenever it reached such a size as to be an object of disfigurement, he was in the habit of paring it down with a razor. During the past two months he thought it had grown rather more rapidly than before, and was therefore anxious to have it removed.

At the time he visited me, the growth presented the following appearances: —

A blunted horn-like protuberance, three-fourths of an inch long, and nearly as broad at its base, sprang from the upper and posterior portion of the left helix. Of a whitish color at its base, it gradually grew quite smoky at its summit, which was more or less jagged in appearance. It was distinctly striated, the markings running in a slightly divergent direction from the summit to the base. At the extremity and in the middle portion it was hard like horn, but near the base it could be easily compressed, though yet comparatively hard. The line of demarcation between the growth and the normal skin was very abrupt. It was not a source of pain to him, nor was there any tenderness on pressure.

Ether having been administered, the growth was removed

by two incisions, extending along either side of the base, and including every trace of affected tissue. The fresh edges were then approximated by a few sutures, and the wound dressed with lint. Union took place by granulation, and at the end of the third week scarcely a trace of the operation could be detected.

July 1st. — No signs of a return of the growth. A small, sharp point, however, similar he says to the one first noticed on the ear, can be distinctly felt on the outer surface of the left eyelid.

NECROSIS OF MASTOID CELLS IN IMMEDIATE NEIGHBORHOOD OF EXTERNAL AUDITORY CANAL. Reported by Charles Laight, M. D., of New York City, through Dr. Buck.

On July 5, 1871, William Quinn, aged thirteen, presented himself at the New York Eye and Ear Infirmary, Clinic of Dr. Albert H. Buck, with the following history. About six years ago he was attacked with pain in the left ear, followed shortly by discharge, which has continued with slight remissions up to present date. Has suffered from the first with pain and noises. Cannot give any cause for his trouble. The patient was a strong, healthy-looking boy.

On examination the left meatus auditorius was found filled with an exceedingly fœtid, thin, purulent discharge. After throwing in two syringefuls of warm water, the discharge seemed to be the same in quantity, and on further examination a piece of dead bone was discovered filling the meatus; when water was thrown against it, it acted as an effectual plug to the discharge from within. The bone was attached to the upper wall of the meatus by a fleshy pedicle, which allowed it to be moved quite freely with the probe. The walls of the meatus, external to the bone, were swollen and quite sensitive. He was ordered to syringe the meatus with a weak solution of acid. carbolic., and to return on July 8th, when it was intended to remove the necrosed bone. He returned then with the fragment, and stated that it had become detached on the day previous (July 7).

On examination, the bone was found to be very irregular in shape, about half an inch in length and one-third of an inch in breadth, with two prominent processes; it was honeycombed throughout its entire substance, with minute cells, resembling perfectly in structure those of the mastoid pro-

cess, and the spongy bone tissue which lies above the meatus. The discharge was much less and not so offensive. With the probe, quite a large cavity could be found on the upper wall of the meatus, at about its middle, with the remains of the pedicle standing out from its outer border. No bare bone was felt in the cavity.

The walls of the meatus were still so inflamed that no attempt was made to discover the condition of the membrana tympani. He was ordered to return July 12, but failed to appear.

A CASE OF NERVOUS DEAFNESS IN WHICH GALVANISM WAS USED UNSUCCESSFULLY. By Robert F. Weir, M. D., of New York.

On the 14th of April, 1870, I was called to see Miss Mary O., aged sixteen, whose history as given by the family physician, Dr. Edward Delafield of this city, was as follows: She had always been considered a "backward" girl, with a clear but sluggish intellect; at the present age, reading with great slowness and difficulty. Has had since early childhood slight general choreic movements and some loss of muscular power in the back and lower limbs, shown only when rising from a kneeling posture. At the age of six, she had an attack of measles, which induced, without any discharge from the ear, a slight deafness; the impairment of hearing, evidently catarrhal in its nature, had, however, so nearly passed away without special treatment, that for some time anterior to the present illness her relatives and friends had not noticed that any existed.

Three weeks prior to first coming under my notice, she had had a decided chill, followed by fever, vomiting, and diarrhœa. This attack, I learned, had been preceded by acute nasal catarrh. On the fifth day of the disease, a marked strawberry-red tongue appeared, accompanied by some slight stupor, and at the end of the first week, it was noticed that she was getting deaf; and in the course of forty-eight hours the deafness became profound, without pain or any other symptoms.

Convalescence was established in about two weeks; and at the end of the third week, when I saw her, her condition was anæmic, and there was general desquamation of the skin, as in scarlatina. In reference to this, I must add that the patient had had scarlatina in early life, and had not been

known to have been recently exposed to that contagion, and that no other children in the family contracted the disease from her,— and also that, without the scarlatinal symptoms, the case would have been similar to attacks that she had had several times previously, and which had been regarded by Dr. Delafield as simple gastric catarrh.

The auditory condition was as follows: loudest voice sounds not heard at all — watch pressed against auricle not heard. Tuning fork applied to vertex cranii, not heard in left ear, very slightly so in right. Bone conduction found to be good by repeating the experiment with aid of otoscope. Drums much sunken, slightly but generally opalescent, and with such loss of polish that the light spots could scarcely be seen, yet sufficiently translucent to distinguish the long process of the incus. Eustachian tubes closed. Moderate chronic naso-pharyngeal catarrh was also present. Tinnitus slight, but not annoying. Further examination revealed that the urine was normal, and that menstruation had been absent for over two months.

The treatment adopted was first to open the Eustachian tubes which, resisting the use of Politzer's bag and the catheter, were finally relieved by the catgut bougie, the obstruction in the right ear existing at the extreme aural end of the tube. The tubes remained open throughout the subsequent treatment, though upon their patency no improvement in hearing took place, the restoration of the drums to a normal position and translucency being the only change that ensued. The general health during the time thus occupied became much better under use of tonics, and menstruation became re-established.

May 9, 1870. Commenced use of galvanic current, using Stöhrer's plate battery with Brenner's rheostat, with the internal arrangement (Erb) with this reaction.

Right Ear X elements 1100 [Rheostat],	Ka S.—hissing
	Ka D.—hissing
	Ka O.—nothing
	An S.—nothing
	An D.—nothing
	An O.—nothing

with XXII El, same formula, only a loud ringing sound was noticed.
Left Ear XVI El, 1100 — same formula.

This formula was nearly always observed and acted upon, without, however, any improvement or change except that in the course of three weeks, by an application of the current every other day, the same sensations occurred in each ear with only two elements and without the rheostat, and the slight noises that existed prior to use of electricity, became much intensified.

The subsequent history, the patient being otherwise in excellent health, is that of thorough trials of iodide of potassium, blisters, quinine, strychnine, and the corrosive chloride of mercury, as the advice of various counsel suggested, in a vain hope that they might perhaps be of service.

In October, 1870, after her return from the country, the galvanic reaction was as follows : —

Right Ear. XIV El.— (no Rheostat)	Ka S.—ringing
	Ka D.— >
	Ka O.— 0
	An S.—ringing
	An O.— "
Left Ear. XVIII El.— (no Rheostat)	Ka S. } loud, clear whistle.
	Ka D. }
	An S. }
	An O. }

A continuance of galvanism, however, afforded no change in the hearing.

Now (May, 1871) she is totally deaf as before, though hearing the tuning fork a very little better in the right ear but not in the left. Tubes open, and general health excellent.

It was at first thought that, although the auditory nerves were implicated, yet that the co-existence of nasal catarrh might warrant the idea of an involvement of the middle ear,

and especially the neighborhood of the fenestra. Yet the accompanying case (though somewhat imperfect) that presented itself at the clinique of my colleague at the New York Eye and Ear Infirmarv, Dr. A. H. Buck, who kindly showed it to me, shows that the whole trouble might well be ascribed to the internal ears alone.

Girl, aged five, one year previously had scarlatina without cerebral complication. Six weeks after began to grow deaf, which became total at end of two weeks. No purulent catarrh. Now tubes open freely. Drums normal. No hearing by watch, voice, or tuning fork.

SOME CASES OF POLYPUS AND THEIR TREATMENT. By Dr. Seely, of Cincinnati.

In reporting the following cases, I have no intention of consuming the time of the Society with anything like a detailed description of each case.

Case I.—The patient, a girl of twenty, had had otorrhœa for fifteen years. When she presented herself for treatment there was only a slight discharge in the right ear; drum-head thickened, hazy, driven in against the promontory and contained a large perforation, below the attachment of malleus. Upon the left side there was well marked facial paralysis, and an enormous mucous polypus, extending out of the meatus. This I removed with the snare, but as the patient was very nervous, I told her to return the next day to have the base touched.

She failed to appear for two weeks, when an examination showed that the polypus was returning, appearing through quite a large perforation in the membrane. The facial paralysis seemed a little improved. Four or five applications of the crystals of chromic acid removed the polypus, and the granulations on the membrane. (The application was made once a week.) In three weeks the paralysis had about disappeared.

After the first or second application of the acid the discharge failed to appear, so I scarcely needed to cleanse the ear to make my application. On the eighth week the perforation had healed, as an inflation of middle ear readily satisfied me.

The case I regarded as interesting: first, from the serious complications; second, from the entire disappearance of these under the treatment; third, from the marked effect of the acid on the discharge; fourth, from the healing of the

perforation, which must have been existing all these years; fifth, and last, from the striking improvement in the hearing, the voice being heard at first only in ordinary tones close to the ear, and in eight weeks to at least ten or twelve feet.

I would say here that I always supplement my treatment of otorrhœa, by treatment through the catheter.

Case II.— This was a young man of twenty-five. The otorrhœa came on after scarlet fever, when he was five years old. The hearing was only of words screamed in the ears. And the ears presented the spectacle of a polypus in either, and, after their removal, enormous granulations. The chromic acid was applied in both, principally introduced for the pedicles of the polypi, but of course, after dissolving, some would touch the granulations.

In this case, after two or three applications, I could distinctly trace the membranes and see the points at which the perforations were located. There was scarcely any discharge after the use of the acid, although the patient would say they had not been cleansed.

When the patient left for his home, I gave him a strong solution of nitrate of silver, and when I last heard from him, he was still greatly improving.

The case seemed to me one full of encouragement for treatment of long-standing ear troubles. This patient, after two months' treatment, could hear ordinary conversation directed into the ear, and the hearing has steadily improved. Further, the case was one of interest, from the wonderful effect resulting to the mental and physical condition. There was a total change from inanity and sluggishness to activity of both mind and body. I am aware, of course, that all who treat aural affections are continually astonished by the effects produced upon the mind and body by ear affections, and the relief afforded by treatment; and that too, now and then, when no actual improvement has been produced in the hearing, — the latter result showing pretty conclusively that the oppression is not the result of the deafness, but of the causes that produce the deafness.

Case III. — A boy of eighteen had had otorrhœa since he was four years of age, but when he presented himself to me, the left ear only was discharging. The right membrana tympani was full of opacities, slightly concave, light spot only a little dot. There were one or two apparently thinned and drawn in points, probably healed perforations. In the left ear a red mass presented, but, making the usual examination with the probe, so essential, in my opinion, for detecting ulcerations of bone, etc., I found the mass admitted of being moved considerably, and I also believed I could separate it into two parts; but the patient was nervous, and I began the application of the acid, and after an application or two, the two protuberances were distinctly seen, and an inflation of the middle ear by an assistant, while I watched the effect, showed me that there were two perforations. The results of the treatment, viz., the disappearance of the growths, revealed distinctly the two openings. Here the acid had about the same effect as stated in the other cases.

Remarks.— I cannot close the account of these cases without insisting strongly on one point in the treatment of all these otorrhœas, which is, getting thoroughly at all the mucous lining of the ear, by means of the Eustachian catheter.

There is not the slightest claim at *originality* set up by me for this treatment, though I will say this,—that I only found the true benefits out of my own experience, not having been led to recognize the possibility of obtaining them by my reading. In addition to the cases reported, of course, I have had others of polypus, and the usual number of granulations, and some polypoid degenerations of the membrane. Some of the polypi I have treated with chromic acid, and have had the best results with it. From the effect on the granulations occurring along with the polypi, I am inclined to believe, with dilution it would prove a very beneficial agent against granulations occurring alone. For this and for the thickening of the middle ear, I have usually employed very strong solutions of the nitrate of silver.

Nitrate of silver only touches the surface, so I have always regarded it a very safe application; but the very fact of its non-penetrating property, makes it a tedious application now and then.

I take it, it is the stubborn cases we are concerned about; for any one must have plenty of cases that recover under a weak solution of any astringent, — even sometimes from mere cleansing. I remember one case, in a little girl, that I treated faithfully four months for otorrhœa, and at the end of that time I could find no denuded bone, nor anything else to account for the stubbornness of the case.

Case IV. — This case was a young man of twenty-two, who, two years ago, for the relief of "catarrh," procured a nasal douche, and gave his schneiderian membrane a warm or cold salt bath every day, till finally a pretty severe pain started up in his right ear, followed in a few days by an otorrhœa.

He only did the ordinary cleansing of the ear, never using any medicine, as he had precious little faith in doctors; but a year's annoyance and some blood appearing in the discharge, made him lose a little of his scepticism, and he applied for assistance. I found a small polypus protruding through a perforation in the lower and outer quadrant of the membrane. He was strumous, and I gave him the iodide of iron. I used the acid on the polypus, and the applications caused the discharge to cease from the first.

I was unable to follow up the case, to see if the perforation healed or not.

I report the case partly for the results of the treatment, though chiefly for the originating cause and the polypus. I am aware that several cases of ear trouble, from the use of the douche, have been published. and that the attention of the profession has been, by them, pretty strongly called to the necessity for care in the use of this instrument, yet I thought this case might be of some additional service.

PARASITIC GROWTHS IN THE EXTERNAL MEATUS. By Clarence J. Blake, M. D., of Boston.

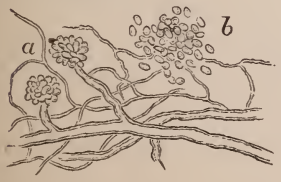
The subject of parasitic diseases of the human ear has been so thoroughly investigated by recent observers that very little apparently remains to be said concerning either their origin or symptoms. Of five cases which have come under my observation, the two following only are reported as presenting some variations from the conditions which Wreden and others, both in Europe and in this country, have taught us to consider as characteristic of this affection. On p. 37 of his paper, entitled "Die Myringomykosis Aspergillina," the author says, that although the frequency of the simultaneous appearance of Penicillium glaucum and Aspergillus glaucus are well known, he has not been able, notwithstanding the most careful examination, to detect in any one of his fourteen cases either a pure bastard example of Penicillium, or one resulting from copulation with Aspergillus.

It is with reference to this statement of Wreden's that the following case possesses its particular interest.

A. B., aged 24, a medical student, consulted me in the latter part of February, 1870, in regard to a simple catarrhal inflammation of the middle ear. The patient was of a full habit, in good health, and had had no previous aural trouble. Aside from the usual appearances, the integument of the meatus on both sides was dry, and slightly reddened throughout its whole extent. Finding relief from the trouble in the middle ear, the patient passed from observation; but returned in April complaining of sensation of fulness in the ears, tinnitus aurium, diminution of hearing, and an intense itching and prickling at the inner end of the meatus. An examination with the speculum revealed unmistakably a mass of Asper-

gillus nigricans covering the membrana tympani, and filling the inner end of the meatus, the left ear being much more seriously affected than the right. Syringing brought away from each ear a compact mass of mycelium and fully developed sporangia, leaving the membrana tympani and inner end of the meatus reddened, moist, and swollen. The usual treatment by means of syringing and the instillation of parasiticides was continued daily for about a month; at the end of which time the growth seemed to have been exterminated, and the patient left the city for a week. During his absence the syringing was omitted, but he was in the habit of moistening the entrance to the meatus for the purpose of relieving an unpleasant sensation of dryness.

At the end of the week he returned, complaining of a renewal of the symptoms in the left ear, characteristic of the presence of Aspergillus. Examination showed the inner end of the meatus filled with this growth which also extended outwards along the walls of the meatus to within half an inch of the entrance, at which point it was continuous with a yellowish white lardaceous layer covering the remainder of the wall of the passage. The whole deposit was removed by careful syringing. That portion taken from the membrana tympani and inner end of the meatus, and examined under the microscope, was unmistakably a pure Aspergillus nigricans, while the yellowish white layer from the outer part of the meatus, and especially that portion of it near the point of termination of the true Aspergillus growth presented appearances which certainly differed from those by which we distinguish Aspergillus and which would hardly permit it to be classed with any of the varied forms of Penicillium. It resembled more nearly some of the specimens of bastard Penicillium figured by Hallier.



The specimen represented in the accompanying wood-cut exhibited a mycelium and fully developed sporangia (*a*). The spores, of which a collection is represented at *b*, were

of a brown color and oval outline, of about the same size as the spores of Aspergillus nigricans. Under a magnifying power of 300, some of these spores showed a double outline. Mingled with this growth there was a close net-work of very fine mycelium.

A portion of this same specimen planted upon lemon-peel, and placed in a closed glass vessel at a constant temperature of about 80° F., gave at the end of three days a well-developed growth of the Leptothrix form of Penicillium. A number of the spores placed in glycerine, and maintained at the above temperature, at the end of a week showed many of the spores swollen and elongated, and exhibiting much the appearance figured by Hallier in his work on parasitic plants. Pl. IV. figs. 5 and 7 (Aspergillus glaucus).

On p. 78 of the above work, Hallier mentions that the Aspergillus requires a drier soil for its growth than does the Penicillium.

In the present case, the first growth was purely that of Aspergillus nigricans confined to the inner portion of the meatus, while the new growth sprang from a surface which was repeatedly moistened, and which was, moreover, freely exposed to the air. Although we are not able to determine the precise condition of the meatus, which is fitted to the nourishment of the parasitic plant, the circumstances in this case would certainly seem to have been favorable to the development of Penicillium, and subsequently in connection with the earlier crop of Aspergillus, of a bastard growth.

The second case is a comparatively simple one.

C. D., aged 68, a carpenter by trade, presented himself at the aural clinic of the Mass. Char. Eye and Ear Infirmary in May last. He complained of a feeling of fulness, tinnitus aurium, and loss of hearing in the left ear, together with an occasional slight prickling sensation at the inner end of the meatus. These symptoms, with exception of the prickling which had been noticed only within a few days, dated back about three weeks.

The watch was heard distinctly when placed upon the tem-

ple and behind the ear, but very slightly at a distance of ⅛th inch from the ear. Examination showed the inner end of the meatus impacted with dry cerumen largely mixed with epidermis, and covered with a light brownish powder which the microscope showed to be fully developed Aspergillus flavescens. With the removal of the ceruminous mass and the accompanying growth the disagreeable symptoms were relieved, and the hearing increased nearly to the normal standard.

As a matter of precaution the patient was directed to return on the second day. He did so and reported no return of the former symptoms. The examination moreover gave no indication of a renewal of the growth, and the patient did not again present himself.* The plug of cerumen being placed in a glass stoppered bottle soon became covered with a luxuriant growth of Aspergillus flavescens; but subsequently, the specimen having been exposed to the air, this was replaced by a still larger growth of Penicillium.

* Shortly after the meeting of the American Otological Society I saw the patient. There had been no return of the trouble.

ABSCESS OF THE CEREBELLUM FOLLOWING A BLOW UPON A DISEASED MASTOID PROCESS.

By William W. Morland, M. D., of Boston.

The following case is chiefly interesting on account of the post-mortem appearances. It adds, also, another to the long list of fatal results, arising sometimes from ignorance, but too often from the culpable negligence or mistaken advice of even experienced and intelligent practitioners. It would seem that a sufficient number of such melancholy instances had been recorded, to put not only medical men, but the community, on their guard; and yet the clear and forcible language in which this "scepticism as to the necessity of treating diseases of the ear," has been set forth by Dr. Roosa, in the *American Journal of the Medical Sciences*, for April, 1871, is nearly as much needed, in the way of warning, as ever. The following sentences from the valuable paper referred to, give us the unvarnished truth: —

"As evidence of the sceptical state of the profession in regard to aural therapeutics, I may adduce the Boylston Prize question for 1870 — 'Criticisms on the recent opinion of a medical writer, that the less serious diseases of the ear may be successfully treated by a well-qualified general practitioner, and the more serious affections by none' — and the fact that distinguished practitioners have, even within a few months, seriously advised patients to stop a course of treatment for suppuration in the ears, on the general ground that it was not best 'to meddle with the ear,' — and this without any examination of the cases, and with an expressed confidence in the practitioner who had charge of them."

A "fact" almost incredible, but abundantly proved.

G. V. M., between five and six years old, when first seen by me in March, 1864, was a pale, delicate boy of marked

scrofulous diathesis. He had had suppuration in the left ear for two years, consequent upon scarlet fever. The physician, who attended him for that disease, *advised that nothing be done for the trouble in the ear.* The increase of the discharge from the meatus, its extremely offensive odor, together with pain, and the formation of an abscess over the left mastoid process, finally compelled the parents to seek advice.

On examination at this time, a polypoid growth was found, nearly filling the left meatus. This was removed, and a course of syringing with warm water, followed by astringent instillations, at once instituted and faithfully maintained, for a long time by my own hands, and subsequently, by the boy's mother, under careful supervision. The abscess was freely opened, — and, in a few days, several pieces of carious bone were removed. The case required close attention through the greater part of 1864, but the patient gradually improved, the integuments over the affected mastoid healing, and the discharge from the meatus nearly disappearing. In 1866 and 1867, he was only infrequently seen. Under tonics and good diet, he grew stronger and more ruddy. In December, 1868, there was, from no well-defined cause, unless exposure to cold, an aggravation of the trouble in the ear. The discharge increased, and, on examination, caries of a portion of the bony meatus was detected. A piece of this was removed, under ether, December 6th, 1868. Close attention again almost wholly quelled the discharge and the boy gained vigor and showed great intelligence. June 15th, 1869, I was called to open another small abscess over the left mastoid. After this, the parts healed, and, through 1870, I hardly saw the patient. The discharge from the meatus ceased; and although the membrana tympani was mainly destroyed, a degree of hearing remained. I was not, however, without uneasiness as to possible future developments. He continued to do well until about the twentieth of April, 1871, when he unfortunately received a blow directly upon the previously injured mastoid process. In a day or two, an

abscess followed and was freely opened. Nearly an ounce of pus flowed out at first, and it continued to ooze daily. Extensive caries was discovered by the probe, which passed inwards and upwards to a depth and with a freedom which alarmed me. There were, at this time, no symptoms calling for extreme measures, such as trephining, etc. The mastoid process was evidently much disorganized and had become flattened. Free issue to the pus was secured by tents, poultices were occasionally used, and the most scrupulous cleanliness maintained. During a short absence from town, and once subsequently, Dr. Robert Willard kindly took charge of my patient, and his account of the progress of the case, and of the post-mortem examination, very carefully made by him, is appended.

"On May 7th, 1871, after eating freely of rhubarb pie, the boy vomited for several hours, and complained of gastric distress and pain over the frontal region. He seemed quite bright, but was very restless. There was a very slight discharge from the mastoid process, which was almost entirely flat, and not tender on pressure, in the least. The attack seemed to be one of simple indigestion, and the symptoms subsided after appropriate remedies. I was called again May 16th, the patient in the mean time having been under the care of Dr. Morland. [Nothing was complained of during these few days — May 10th to 14th — but anorexia, weakness, and a degree of the pain in the *frontal* region. There was no pain in the affected ear, nor in the mastoid process. There was occasional, but very slight, nausea; nothing like convulsions or paralysis. W. W. M.] I found him in bed, in a semi-comatose state; the eyes were closed. There was a good deal of wandering, but, on being spoken to, he appeared quite rational. He rarely attempted to open his eyes, and when he did, it was evidently with much effort. He had screamed a good deal, the voice being pitched quite high, and there had been several attacks of convulsions. But the latter and the sharp cries speedily subsided under the use of the bromide of potash. No paralysis was noted at any time.

Slight divergent strabismus was remarked, which disappeared when he was aroused. The irides also responded to the light. He understood perfectly everything said to him, and the sight was not at all affected. No pain was complained of except the frontal headache, and that ceased after a few days. The appetite was good throughout, and he took large quantities of liquid nourishment. The thirst was great. All the bodily functions were regular until towards the close of life, and he always gave notice when evacuations were necessary. The pulse at first was above one hundred, but slackened daily, until, twenty-four hours before death, it was scarcely 60. Respiration and temperature normal. The tongue showed a whitish coat throughout. The delirium continued up to the day of his death, May 25th, 1871, when he expired quietly at 8.30 A. M.

The *treatment* consisted chiefly of the administration of bromide of potash, persistently given, in large doses. Under its use, the violent delirium subsided into quiet muttering. Counter-irritation to the back of the head and neck was resorted to, and apparently with temporary benefit. The diet was as nourishing as possible. Large quantities of beef-tea and milk, with eggs, etc., were given and digested.

The *autopsy* was made at 10.30 A.M., *May 26th*. Head alone examined. The arachnoid and the surface of the cerebrum very dry; vessels of pia mater large and exceedingly numerous; lateral ventricles distended with turbid serum; the amount much greater than normal. The remainder of the cerebrum showed nothing unusual. On slitting up the *tentorium cerebelli*, pus, in considerable quantity, welled up from below; and on attempting to remove the cerebellum, a large portion of the left hemisphere was found to be completely disorganized, and its place filled with sanious pus, to the amount of three ounces, and with broken down fragments of the cerebellum itself. There was a small patch of clearly defined meningitis, circular, about half an inch in diameter, with a central opening — the mastoid foramen — into which a probe being passed with some slight force, it

found its way straight through the necrosed mastoid out of the fistulous opening of the abscess, which was situated in the middle of the mastoid process.

There was a small polypus in the left meatus externus; complete destruction of the membrana tympani, with a fistulous passage communicating with the necrosed mastoid from the meatus.

The various nerves which passed through the left cerebellar fossa were in good condition, save the auditory, which was almost entirely disorganized.

The left mastoid process was carious in all directions — nothing but the mere shell of its external walls being left.

The case seems to show that this extensive disorganization, or abscess of the brain, was the direct result of the blow upon the already carious mastoid, awakening, either by a fragment of carious bone, or by the entrance of pus into the cranial cavity, through the mastoid foramen, either directly, or by means of the circulation, the inflammation which resulted so destructively."

A CASE OF REPRODUCTION OF THE MEMBRANA TYMPANI. — By H. N. Spencer, M. D., of St. Louis.

The following brief notes of a case of unusually perfect recovery from grave chronic disease of both ears, are perhaps of sufficient interest to justify their publication.

Willie Graham, age 11 years, became affected ten years ago, and at one year of age, — after an attack of measles, — with an acute inflammation of the middle ear, resulting in perforation of the membrana tympani, for which nothing was done.

The consequence has been, from a process of inflammation continued over ten years, an entire loss of the membrana tympani (both ears being affected alike) and of the ossicula: [unless it may be that the stapes remained. I am ready now to infer that such was the case. It was difficult at the time to determine. In addition to the ordinary bar to settling this point, must be taken into consideration, the swollen condition of the lining membrane of the internal wall of the cavity.]

At the time of application for treatment, December 12, 1870, there was found caries located at the point of contact of the ossicula with the tympanic wall.

Hearing distance was R. and L. two (2) inches.

The ordinary treatment was pursued. The result has been a complete recovery of healthy condition in the parts, with *restoration* of the membrana tympani in each ear.

The membrane is wholly free from adhesion to the promontory or head of stapes.

The *malleus* and *incus* are wholly gone.

The membrane, stretched across the bottom of the meatus in almost natural plane, leaving space for the middle ear,

admits freely of inflation under operation of Valsalva's method.

The membrane has the appearance in texture and color of the normal membrane, but without the light spot.

The hearing distance, by the same watch as employed in the beginning, is R. 6 feet; L. 8 feet.

Conversation is heard without any difficulty whatever. Any nicer test of the hearing than this is precluded, by reason of the age of the patient.

THE TREATMENT OF CHRONIC PURULENT AURAL CATARRH, AS INDICATED BY THE SECRETION.

By Chas. Inslee Pardee, M. D., of New York.

A method of treating this disease which enables the surgeon to apply a remedial agent to each individual case, with entire confidence in its appropriateness, is "a consummation devoutly to be wished."

There are various reasons as we know, why such a method has not been found. Prominent among them are the facts: first, that our knowledge of the pathological changes is imperfect; and second, that, in our diagnosis, we are obliged, to a very great extent, to depend on an objective examination which is liable to mislead us. It is by no means easy from such an examination to estimate, with any degree of accuracy, the exact relations of the parts, their color, or in fact any of the changes. Besides, a greater or less portion of the membrana tympani usually remains, and affords an additional, — a mechanical obstacle, to exact observation.

I am led to believe that in the secretion we have a valuable, and, indeed, a most reliable indication for treatment.

Different pathological conditions in the membrane which lines the middle ear show their characteristic secretion.

Now, according to pathologists, the changes in this disease are developed as follows: —

First there is increased vascularity, swelling, with a tendency to exudation, and the secretion is mainly mucus.

This secretion of mucus seems to be a characteristic symptom of the inflammatory stage of the disease, or of a hyperæmic condition of the membrane which lines the middle ear.

Second, the inflammation or hyperæmia may be modified in this way: the disease may go on to the development of excessive free cell formation. The secretion, then, is purulent.

The tendency of a great number of cases, those occurring in strumous subjects especially, is to relapse into the hyperæmic condition. A case has been under observation, the secretion purulent, and suddenly, from a slight cause, a cold perhaps, or from the action of injudiciously applied remedial agents, it gives evidence of a modification in the course of the disease. The secretion has changed to mucus.

Such an occurrence is by no means uncommon, and every one of us must have observed the fact. It is probably owing to it that we have been taught to regard a great number of remedies as appropriate for this disease, and told that we must "ring the changes." We may ring the changes, to be sure, but not select our remedies at hap-hazard.

The secretion, therefore, indicates the existing pathological condition, and enables us, with considerable certainty, to apply proper remedial agents.

The precise object towards which our therapeutic efforts must tend, seems pretty clear. They must tend to check the hyperæmia and set up a healthier action; to control and limit the excessive development of free cell formation.

Essentially different applications are required in either case.

If the case gives evidence of hyperæmia, as shown by the secretion of mucus, use the

NITRATE OF SILVER.

This remedy is so effectual that in a considerable number of cases, it is unnecessary to try any other. Instill into the ear a solution of forty [40] grains to the ounce of water, and repeat the application every forty-eight hours until a cure is effected or the discharge becomes purulent.

The appearance of a discharge of pus is not to be regarded as a discouraging circumstance. Indeed, as a matter of clinical experience, it is safe to assert that under the use of proper remedial agents we may confidently expect a steady, gradual diminution in the amount of secretion and a reasonably rapid recovery.

But in the treatment of the latter condition, we must not forget that our efforts should tend to control and limit the excessive development of free cell formation. The end is best accomplished by the use of weak astringents.

Sulphate of zinc, acetate of lead, and alum, are all valuable agents, and may be used in solution of from two (2) to four (4) grains to the ounce of water, instilled into the ear once a day. Inasmuch as the desired effect is that of a weak astringent, other remedies which cause it may answer the purpose just as well.

It is almost unnecessary to add that thorough cleansing of the parts before making an application is important. It is absolutely essential. Careful drying of the diseased surfaces, after cleansing, by means of a piece of soft cotton, is equally essential. Indeed, we cannot lay too much stress on this point. Remedial agents are infinitely more efficacious when the precaution is used.

THE EXAMINATION OF SIXTY LUNATICS AT THE BLACKWELL'S ISLAND LUNATIC ASYLUM, N. Y., THIRTY OF WHOM HAD HALLUCINATIONS OF HEARING, AND THIRTY HAD NONE; WITH THE VIEW OF DETERMINING WHETHER DISEASE OF THE EAR HAD ANY AGENCY IN THE PRODUCTION OF THE SYMPTOM. By O. D. Pomeroy, M. D., of New York.

The hallucinations referred to were human voices; the patients imagining that some person or persons were talking to them.

They were all females, many of them having symptoms of nymphomania, and nearly the whole of them having "nervous" symptoms.

In their description of the voices heard, there was almost a constant reference to some male acquaintance, or friend, which would lead one to suspect that the phenomenon depended on the condition of the brain and nervous system, rather than on the condition of the organ of hearing.

It was thought by the writer that if an equal number of cases having hallucinations were carefully examined, and the result placed beside a similar examination of an equal number of cases not exhibiting this symptom, the subjects being taken from the same walk of life, and that if a larger number of the hallucination cases presented symptoms of present or past aural affections, it was fair to infer that diseases of the ear had an agency either in modifying or producing these phenomena. Tröltsch, in his work on the ear, says in regard to the tinnitus aurium of the insane:* "It is a very important question whether the aural hallucinations occurring

*Second American edition, translated by D. B. St. John Roosa, M. D., p. 531.

in insane patients, do not frequently depend on peripheric tinnitus, which is exaggerated by the patients." "It would be well worth the trouble, if physicians for the insane would examine the ears of such patients."

He quotes *Prof. Ludw. Mayer*, formerly of the insane asylum in Hamburg, who gives the history of a melancholic patient, who was relieved of a sound in the ear resembling the cry of an infant, by the removal of a plug of inspissated cerumen which had caused deafness of one side. On the same page Schwartzer is quoted as follows: "Subjective aural sensations, which are caused by demonstrable affection of the ear, may, in predisposed persons, especially when there is a hereditary tendency to mental disease, become the direct cause of aural hallucinations, that may accelerate the outbreak of mental disease. I have treated such a patient for a long time, and she has been protected from a threatened attack, by local treatment of the aural disease." "In other cases, insane persons, who suffer from aural disease, distinguish its tinnitus from their illusions or hallucinations. They hear their 'sounds' simultaneously, but independently of the tinnitus aurium."

Tröltsch further states that "*Koppe* speaks in the same way, more in detail. He examined thirty-one insane persons in the insane asylum at Halle, in whom considerable disease of the auditory apparatus could be detected. In none of them was there tinnitus, without, at the same time, the existence of aural illusions and hallucinations. Seven insane persons also had a chronic hyperæmia of the vessels of the handle of the malleus, and besides the subjective aural sensations, aural illusions and hallucinations." In two cases of inspissated cerumen, the tinnitus disappeared after the removal of the wax, but the hallucination remained. In several cases which are fully detailed, both the tinnitus and the hallucinations disappeared after local treatment of the ear. Two cases were particularly interesting, where only one ear was affected, and where the sounds were only heard on that side."

Tröltsch * again says: "Perhaps we may designate the one variety 'as nervous tinnitus aurium, the other as material or acoustic,' and which may 'exist at the same time.'" William Hamey, F. R. C. S., † speaks of "hysterical, hypochondriacal and nervous patients" as suffering from every possible form of tinnitus. Wilde says, ‡ "In some forms of hysteria, and in cases of mental aberration and lunacy,— as those familiar with such know full well,— the patients often complain of all manner of noises, whisperings, and unnatural sounds; but these are, I believe, generally the result of a disordered imagination, like the ocular spectra which afflict certain individuals." Saissy § speaks of symptomatic tinnitus as depending on "nervous diseases such as hysteria, hypochondria, convulsions, and mental alienations."

The cases are thus tabulated: —

NO HALLUCINATION.	HALLUCINATION.
Cerumen in ext. auditory canal, in 4 instances,	Cerumen in ext. auditory canal, in 3 instances.
The membrana sunken and opaque, 19 times.	The membrana sunken and opaque, 18 times.
Membrana congested, 5 times.	Membrana congested 1 time.
Occasional pains in ears, 2 times.	Occasional pains in ears, 6 times.
Diffuse acute infl. of ext. canal, 0 times.	Diffuse acute infl. of ext. canal, 1 time.
Granular membrana tympani, 0 times.	Granular membrana tympani, 2 times.
Catarrh of E. tube, 0 times.	Catarrh of E. tube, 1 time.
Acute otitis media recently or at present, 1 time.	Acute otitis media recently or at present, 4 times.
Perf. of m., and discharge 0 times.	Perforation and discharge, 1 time.
All these were females, but 2.	All these were females.

* Ibid. p. 527.

† The ear in health and disease. London, Henry Renhsaw, 1865, p. 25.

‡ Diseases of the Ear. Philadelphia, Blanchard and Lea, 1853, p. 361.

§ An Essay on the diseases of the Internal Ear. J. J. Saissy, M. D,, etc. Baltimore, Hatch & Dunning, 1829, p. 132.

NO HALLUCINATION.	HALLUCINATION.
H. D. (hearing distance), normal 25 times.	H. D. normal, 22 times.
Tinnitus aurium, 4 times.	Tinnitus aurium, 6 times.
The record, no history of ear trouble, occurred 24 times.	The record no history of ear trouble, occurred 13 times.
History of ear trouble, 6 times.	History of ear trouble, 17 times.
Tinnitus occasionally, 2 times.	Tinnitus occasionally, 4 times.
H. D. not normal, 5 times.	H. D. not normal, 8 times.

From the above table it will be seen that there is no striking difference between the cases having hallucinations and those not having them. The most conspicuous differences are as follows: —

The record "membrana congested" occurs five times *without hallucinations,* and not a single time with. The record "occasional pains in the ears," occurs two times in the first column, and six times in the second.

"Acute otitis media" occurs only one time in the first and *four* times in the second column.

H. D. normal, 25 times in the first, and 22 times in the second column.

"No history of ear trouble" occurs 24 times in the first, to only 13 times in the second division.

"History of ear trouble" occurs 6 times in the first, and 17 times in the second.

Tinnitus aurium occurred about twice as often in the hallucination cases, which is somewhat worthy of note. The H. D. was considerably better (as 8 to 5), in the no-hallucination cases.

So the result of the examination is a little in favor of the hallucination cases being oftener associated with ear disease.

The proportion is not, however, anything like that previously quoted from Tröltsch and others. Neither was it possible to observe any connection between the tinnitus aurium and the hallucinations, or even to make other observations so

exactly laid down in the quotations,— the patients being hardly intelligent enough for that purpose. Certainly the aural disease did not, in a single instance, develop or excite the insanity, as has been quoted.

The fact of these patients all being females except two, was purely accidental, those being furnished for examination probably as a matter of convenience.

Dr. Parsons, physician in chief of the above institution, believes that aural hallucinations occur somewhat more frequently in females than males.

Dr. Kellogg, assistant physician in the same institution, thinks there is no difference in regard to sex, the one being as subject to aural hallucinations as the other. The histories of each patient were given to the writer, but were not considered as being specially pertinent and are omitted.

The subjects were of the middle period of life. The disease was usually chronic mania or melancholia.

In reading over these records, one certainly must feel a suspicion that aural diseases have some influence in producing aural hallucinations. But in very many of these cases no possible connection could be made between the hallucination and disease of the ear. The statements made by others would seem to be exaggerated at least. In the collection of the above facts, I am greatly indebted to Dr. Parsons, the physician in chief of the institution, and to his assistants, Drs. Kellogg and Howe.

A RECORD OF TWO HUNDRED AND EIGHTY-SEVEN INFLATIONS OF THE TYMPANIC CAVITY, WITH A VIEW OF DETERMINING THE FREQUENCY WITH WHICH THE DRUM MEMBRANE IS REDDENED. By O. D. Pomeroy, M. D., New York.

Inasmuch as it is frequently stated in the books on diseases of the ear, that inflation of the tympanic cavity generally causes reddening of the membrane of the drum, and therefore is of considerable value in determining whether the cavity has been entered or not, it was thought proper to institute the following investigations, in order to test the correctness of the proposition.

The writer had long been of the opinion that the frequency with which the membrane was congested by the inflation, was much overrated, and consequently false conclusions might be arrived at, by those holding the older opinion on the subject. Most of the cases under observation were of the kind known as "chronic aural catarrh," "tubal catarrh," "otitis media chronica," etc., although a few were normal cases. The hearing distance is noted in each instance, giving a fair idea of the amount of ear trouble present.

Case 1.—H. D. (hearing distance) w (watch) in contact; infl. (inflated; 12 times, 4 or 5 minutes at each time; n. r. (not reddened) 12 times.

Case 2.—H. D. 10 in.; infl. 8 times; n. r. 8 times.

Case 3.—H. D. 2 in.; infl. 1 time; n. r. 1 time.

Case 4.—H. D. 30 in.; infl. 12 times; n. r. 9 times; r. (reddened) 2 times; uncertain (0) 1 time.

Case 5.—H. D. 30 in.; infl. 12 times; n. r. 9 times; r. 1; 0, 2.

Case 6.—H. D. 4 feet; infl. 11 times; r. 11 times, 5 of which were done very slightly to test more accurately.

Case 7.—H. D. 8 in.; infl. 6 times; n. r. 4 times; 0, and 2.

Case 8.—H. D. 8 in.; infl. 6 times; n. r. 5; 0, 1.

Case 9.—H. D. normal; infl. 9; n. r. 9.

Case 10.—H. D. pressed; infl. 10 times; n. r. 6; r. 4.

Case 11.—H. D. n. (nails snapped) 2 in.; infl. 9 times; n. r. 4; r. 5.

Case 12.—H. D. w. 1 in.; infl. 12 times; n. r. 12 times.

Case 13.—H. D. w. (watch) 4 in.; infl. 11 times, n. r. 8; r. 2; 0, 1; (when nothing is mentioned, the watch is understood as being used to test H. D.)

Case 14.—H. D. 8 in.; infl. by steam 20 times; n. r. 20; infl. by air, 4 times; n. r. 4. Membrane very thick and opaque in this case.

Case 15.—H. D. 4 in.; infl. by steam, 20 times; n. r. 20 times; infl. by air, 4; n. r. 4.

Case 16.—H. D. w. pressed; infl. 5; r. 3; n. r. 1; 0, 1.

Case 17.—H. D. 1 in.; infl. 6; n. r. 6.

Case 18.—H. D. 9 in.; infl. 5; n. r. 2; r. 3.

Case 19.—H. D. n. 2 in.; infl. 9; n. r. 8; r. 1.

Case 20.—H. D. w. 2 in.; infl. 9; n. r. 8; r. 1.

Case 21.—H. D. normal; infl. 3; n. r. 2; r. 1.

Case 22.—H. D. 4 in.; infl. 4; r. 3; n. r. 1.

Case 23.—H. D. n. 7 in.; infl. 4; n. r. 1; r. 3.

Case 24.—H. D. n. 20 in.; infl. by steam, 12; n. r. 12; infl. by air, 13; n. r. 13. Membrane much thickened.

Case 25.—H. D. pressed; infl. 9; n. r. 8; r. 1.

Case 26.—H. D. 12 in.; infl. 8; n. r. 8.

Case 27.—H. D. normal; infl. 6; n. r. 3; r. 2; 0, 1.

Case 28.—H. D. normal; infl. 6; n. r. 4; r. 2.

Case 29.—H. D. ?; infl. 7; n. r. 6; r. 1.

Case 30.—H. D. ?; infl. 6; n. r. 5; 0, 1.

Case 31.—H. D. normal; infl. 12; n. r. 5; r. 7.

Making 31 cases of inflation, with 287 inflations, of which 224 did not redden the drum membrane, 53 did; and 10 in which the observation was uncertain.

Thirty-two inflations were done by steam in a thorough manner, with not a single case of reddening of the membrane. Forty-seven inflations occurred in patients of normal hearing, and resulted in reddening the membrane 21 times; 25 without, and one uncertain.

117 inflations occurred, in cases where the H. D. was 8 in. or over, with reddening 29 times, absence of, 81 times; and uncertain, 7 times.

When no mention is made of the mode of inflation, Politzer's plan is usually understood: that in the writer's opinion being more complete when successful, than any other method. The steam cases very naturally were done by means of a

hard rubber catheter and catheter-holder, the latter being the one suggested by the writer.

The observations on the steam cases are probably not a fair average; it being undoubtedly true that hot steam (mixed with air so as not to burn the patient) is more likely to congest the membrane than cold air.

The steam cases were generally old ones with thickened, sclerosed, and more or less devascularized membranes, not as susceptible to congestion as those more nearly normal.

Besides, the catheterization is probably not as effective in inflation as Politzer's method, especially if a large bag is used as in the present case. It is worthy of remark, that the percentage of congestions greatly rises in the cases of normal or good H. D., bearing out the proposition just made, that old and bad cases are less liable to be congested than others. The figures, as previously stated, being 287 inflations in all, with only 63 congestions, and 10 uncertain. With normal H. D. 47 inflations resulted in reddening 21 times, with one uncertain. 117 inflations where the H. D. was 8 in. or over, reddened 29 times, uncertain 7 times. So in the most favorable cases the membrane will redden less than one-third the number of inflations.

Cases proving obstinate to congestion were inflated very thoroughly, in some cases four or five minutes being occupied at a sitting; while other cases, as in case six, were congested by the slightest inflation. In the case just mentioned, although the H. D. was 4 feet, the membrane had so far lost its lustre as to spoil the light point. It was so thin as to bulge unusually during inflation, although not to the extent seen in some old atrophic cases. The explanation in this case of the congestion is not easy to make.

It is worthy of remark that a few cases were found with reddened membranes after the observation of "not reddened" had been made. The explanation here may be two-fold; a little time needs to elapse between inflation and the resulting congestion; and the handling of the ear by students, perhaps somewhat roughly, with the use of the specu-

lum may contribute to the result. In a certain number of the above cases, artificial light was used with and without a condensing lens, which not only throws considerable light into the ear, but heat also, which latter certainly will congest the membrane as a prolonged ophthalmoscopic examination will swell the retinal and choroidal vessels of the eye.

A person of careful observation may ask, Was the cavity certainly inflated in every instance recorded? It may be answered that the evidence of inflation in every case was one or more of the following: An increase or decrease of the H. D.; the production of a feeling of fulness in the ear, or some positive change of sensation; or the production of tinnitus aurium temporarily; or the relief of the same for a few moments; or by inspecting the movements of the membrane during or after inflation. The diagnosis tube was used somewhat, but not relied upon as proof of inflation, it requiring too much time and practice to distinguish exactly between the sounds made in the throat and those in the tympanic cavity. The vapors of chloroform, ammonia, iodine and some others, of an irritating nature will readily congest the membrana tympani.

The observation was made in the above cases mostly by daylight, with a concave mirror, and it is believed in a careful manner. Every portion of the membrane was inspected, and when congestion was present, it usually commenced about the tubercle of the malleus, at the periphery of the membrane, subsequently reddening the manubrium, and occasionally reddening the whole membrane; in the latter case, first commencing at the periphery and at the manubrium, and extending so as to meet, thus involving the whole membrane.

The above observations are not made with such exactness as to preclude the possibility of false conclusions, but it is believed the results arrived at are sufficient to modify the opinions formerly held on this subject.

RECURRENT FIBROMÆ OF THE LOBES OF BOTH EARS. By R. M. Bertholet, M. D., Philadelphia.

The fibroma or fibroide of the lobe of the ear, is a tumor of comparatively infrequent occurrence among the white races. It has, however, long ago been stated by Kramer[1] and other eminent aural surgeons, that these neoplasms are met with most frequently, and attain their greatest size, among the colored races of India and Africa. Although no statistics have, as yet, been collected to show that the same statement will hold good in regard to the relative immunity of the one race or the other in our own country, yet the experiences of the majority of our surgeons[2] would seem to warrant the conclusion that here also the negro manifests the same unmistakable liability or tendency favoring the development of such growths in this situation.

The following is a brief history of the development of the fibromæ, as obtained from the patient, Josephine B., colored, aged twenty-nine. Her ears were pierced for rings, nine years ago; four months after the perforation she first observed a small hard tumor growing from the cicatrix in each lobe. The development of the tumors was attended with no pain, and progressed very slowly, until each had attained about the size of a walnut, at the end of four years, when they were removed. Four months after the operation they again appeared, so that the secondary masses which are seen in the accompanying photograph, have been growing upwards of four years.

These pendulous tumors had no connection with the cartilaginous portion of the auricle, they are very hard and inelastic; upon section have a dense white appearance. That

[1] Ohrenheilkunde, Berlin, 1849; p. 209.
[2] Gross. System of Surgery, vol. 2.

upon the right side is distinctly lobulated and ovoidal in shape — measures two and one-half inches in its long, one-half inch in its transverse, diameter. The growth upon the left lobe had attained but one-half of this size. The microscopic examination shows that the structure is made up almost entirely of compact connective tissue with intersecting yellow elastic fibres, with few, but strongly developed blood vessels running through it. Too short a time has elapsed since the operation for repullulation to have taken place.

FIVE CASES OF FATAL OTORRHŒA, WITH REMARKS ON THE COURSE BY WHICH SUCH CASES LEAD TO DEATH. By J. Orne Green, M. D., of Boston.

The accompanying cases are submitted to the Society as contributions to the pathology of the ear.

For the opportunity of witnessing the following autopsy and dissecting the specimen I am indebted to the kindness of Dr. Francis Minot. The history is taken from the hospital records.

I. B., aged 28, pedler; entered the Massachusetts General Hospital, on May 12, 1869. Both parents were phthisical. He himself had always been well till two years ago, when he had an abscess under the right jaw, referred by him to a carious tooth, but more probably due to an inflammation of the tympanum. At the same time a discharge began from the right ear, which has continued ever since, but given him no special inconvenience. In October, 1868, after exposure, had pleurisy, and ever since has had a cough, with occasional bloody expectoration.

On May 2d, after a long walk in the rain, the muscles of the right side of face became paralyzed, and this was soon followed by general pain on the right side of head. Ten days after, he entered the hospital, complaining of constant vertigo and pain on the right side of head, but was able to be about. All functions natural. Pulse 96.

May 17th.— Pain in head continued severe, keeping him awake at night. Towards morning, without marked chill, a heavy cold sweat with nausea, and followed by considerable prostration.

From this time to the 22d, vomiting was very frequent, but then ceased; the pain in the head continued severe, and could not be relieved by any opiates.

23d.— A careful examination showed that all parts sup-

plied by the right facial nerve were completely paralyzed. The hypoglossal was also affected, for the whole body of the tongue when protruded, was pushed to the right side, but the tip could be moved freely from side to side. Sensation was good. The right arch of the palate was higher and rounder than the left; the uvula was slightly inclined to the left.

24*th.*— The pain in the head was for the first time relieved by a subcutaneous injection of sulphate of morphine, gr. ¼. There was some delirium.

25*th.*— The delirium had increased, and there was great restlessness at night; which was relieved, however, by morphine, gr. ¼, subcutaneously.

26*th.* — Became gradually comatose, the respiration shorter, and without any new symptoms, he died.

The autopsy, six and one-half hours after death, by Dr. John Homans, revealed as follows: —

"The right external auditory meatus filled with pus.

"*Head:* convolutions of brain universally flattened; arachnoid rather dry, fluid opaque. Both ventricles contained an unusual amount of fluid which was opaque, and, at depending portions, purulent. Membranes of the right half of Pons Varolii, covered with a grumous deposit, and the substance of the lower part of Pons, and of the corresponding olivary body was broken down nearly to the wall of the fourth ventricle. Substance of the right half of cerebellum destroyed to the depth of three-fourths of an inch. Tissues in the neighborhood of the ventricles much softened. The base of the brain covered with a purulent deposit which extended forwards to the optic commissure, and over to the left side of Pons.

"*Thorax:*—Many old pleuritic adhesions.

"*Lungs:*— Tubercular masses in both.

"*Abdomen:*— Tubercular masses in peritoneum. Many tubercular ulcerations of the large intestine."

Dissection of the petrous bone. The meatus internus filled with pus, and the dura mater on its edges for the dis-

tance of half an inch dissected up, leaving the bone bare but not carious. On washing away the pus, the facial and auditory nerves at their exit from the meatus were distinct and apparently not affected. At the orifice of the aqueductus vestibuli, on the posterior aspect of the petrous portion of the bone, the dura mater was bulging for a space half an inch in circumference, and pus was exuding through a small opening.

Lateral and petrosal sinuses were not affected. No caries of the bone at any point.

Roof of tympanic cavity unusually thick: this was removed and the cavity found filled with muco-purulent matter; the mucous membrane lining it was much swollen and of a livid color. Malleus whole and distinct, but no signs of the incus.

The cavity was then opened by sawing through the whole bone. The membrana tympani was much thickened by hyperæmia and swelling of its mucous lining, and was perforated both anterior and posterior to the manubrium, the anterior perforation being the larger. The malleus was normal and in normal position, but completely buried in the swollen mucous membrane. The mucous membrane of the promontory was so swollen as to nearly fill the depressions of the fenestræ, ovalis and rotunda. No traces of the stapes could be found. Thick, adhesive, purulent matter exuded from both fenestræ, and the vestibule was completely filled with it. The cochlea was opened, was free from pus, and appeared to the eye normal. On laying open the meatus internus, the facial nerve contained in it appeared normal, but the auditory nerve was discolored, and surrounded by and infiltrated with pus. The Fallopian canal in its passage through the tympanic cavity seemed to be only a groove, no bony wall separating it from the cavity, and the facial nerve was here only covered by the swollen mucous membrane. The inflammation had apparently not extended into the Fallopian canal. A microscopic examination of the facial nerve taken from the tympanic cavity showed no disorganization.

The semi-circular canals contained no pus, and appeared normal. The mastoid cells were few in number, but all contained purulent matter.

The extensive breaking down of the substance of the base of the brain on the right side, and the purulent deposit there, showed that this was the oldest spot and centre of the brain disease. The presence of pus in considerable quantity beneath the dura mater at the orifices of the meatus internus and aqueductus, and these collections only communicating with the interior of that membrane by small openings, indicated that the matter had collected there from the side next the bone, and had not penetrated from that next the brain. The bone not being carious at these points, it was necessary to look further; and following the pus into both these passages it is traced directly into the vestibule, which, from the destruction of the stapes, communicated directly with the tympanum. Further, the part of the brain disorganized was just along the course of the auditory nerve of the affected ear, and this nerve was found throughout its course discolored.

From these facts the source of the brain disease can be distinctly traced. From ulceration of the membrane around the stapes, the purulent matter of a chronic inflammation of the tympanum had penetrated the vestibule, and from here running along the only two passages communicating with the interior of the skull, had emerged at the aqueductus vestibuli and meatus internus, and thus set up a fatal meningitis. A portion of the infecting matter had also probably run along the auditory nerve.

The first symptoms in the case, aside from the otorrhœa of two years' standing, were paralysis of the facial nerve on the affected side, followed by constant dizziness, nausea, vomiting, and severe pain referred to the whole side of the head. After several days the vomiting ceased; the severe pain in the head could not be relieved by any remedies. The right hypoglossal nerve became paralyzed. The last two days of life he was delirious, and died on the twenty-fourth day from the beginning of the head symptoms.

II. G. H. W., aged twenty-two, a stout, healthy negro, entered the City Hospital, April 13, 1869, with a number of small superficial scalds on scalp and face. Three days afterwards, without known cause, he was seized with severe pain in right ear, soon followed by discharge. On examination at this time, I found an acute purulent inflammation of the right tympanum, with a small perforation on the anterior segment of the membrana tympani and a free discharge of pus. The inflammation was treated with leeches, syringing, and astringent instillations, and ran a very short and favorable course. The perforation, which had enlarged to one and a half lines in diameter, began to heal, and on May 12th he was discharged, to report as an out-patient; the perforation had contracted to the size of a pin-hole, the discharge had entirely ceased, and the hearing had been rapidly improving for several days.

On May 15th he returned, with severe pain in the ear and discharge, and reported that on the day of his discharge from the hospital, he laid on the damp grass and took cold. Examination showed the tympanum again intensely inflamed, and the perforation enlarged. He was immediately taken into hospital, and treated as before; but two days afterwards an otitis externa set in with so much swelling that the deeper parts could not be seen; in about ten days this had subsided and inspection then showed a perforation about two lines in diameter, through which a small polypoid growth, the size of a pea, protruded. This was removed close to the membrana tympani by means of the wire snare, and the base cauterized with pernitrate of mercury. Two days after, the whole base of the polypus, with the slough from the caustic on one side was washed out by syringing.

The discharge gradually ceased under treatment, the mucous membrane of the tympanum could be seen smooth and free from inflammation, the membrana tympani began to heal rapidly, and on June 2d he was discharged and ordered to report in two days, as an out-patient. No more was seen of him, however, till November 23d, when he gave the fol-

lowing account. Soon after leaving the hospital he went into the country, and was kept there for four months to work off an old debt, being obliged all the time to sleep in a barn. During this time he had a slight discharge from the ear, for which nothing was done. Two weeks ago he had severe pain in the ear, and a swelling formed in front of tragus: this pain has continued severe, and the swelling has increased.

He now has sharp, lancinating pains in ear, over the whole right side of face and head, difficulty in swallowing, and headache. There is a moderate discharge of thick pus from the meatus, and the whole of this passage is filled by a firm polypus with a red granular surface. He is much emaciated, feverish, with hot skin and rapid pulse. In front of the tragus is a swelling extending on to the cheek and down the neck, without fluctuation; only slight tenderness over mastoid process, and no swelling or redness. Appetite poor.

Leeches and blisters were applied about the ear, and narcotics ordered, *p. r. n.*

On Nov. 28th, dry râles were reported over both backs and there was a bloody viscid expectoration. Other symptoms same as on entrance.

Dec. 7th.—Pain in ear and head continued: complained of great vertigo, and vomited all food.

Dec. 8th.—I saw him for the first time since his re-entrance, at the request of Dr. Cheever; etherized him, and attempted to remove the polypus. The wire snare surrounding the growth was passed in as deeply as possible, and the mass cut off, apparently about one-fourth of an inch from the position of the membrana tympani. The walls of the meatus were covered by exuberant granulations. This operation was followed by such a rapid and profuse oozing of blood from the granulations and from the polypus, that it was impossible to remove more of the growth. With the probe, bare bone could be felt through the granulations. An incision was made into the swelling in front of the tragus, but no pus found.

Dec. 10th.—The pain in ear was less; purulent discharge

continued. Complained of sore throat and dysphagia. Liquid diet.

Different astringent instillations and caustics were tried to prevent the growth of the polypus and granulations, but without avail; the profuse bleeding prevented any further attempt to remove the polypus. The vertigo, vomiting, and pain, which were much relieved for a few days after the operation, returned with increased violence.

On January 3d, however, the vomiting had ceased, but the dysphagia had much increased, and on protruding the tongue it was drawn to the right side from paralysis of right hypoglossal nerve. Pain and discharge in ear as before. Under ether the swelling in front was freely incised by Dr. Cheever, but no pus found, and a seton was inserted over mastoid process. For the next week there was a slight improvement in the general symptoms, but there was occasional severe pain in ear, and the paralysis of hypoglossal remained as before.

On the 26th he began to fail rapidly. There was occasional epistaxis and obscured vision, but no difference in pupils. No new paralysis.

On the 28th, semi-conscious. Tongue dry; could not be protruded. No pain.

On the 30th he became profoundly comatose, without stertorous breathing; and, without convulsions, chills, or any new paralysis, died.

The autopsy by Dr. Webber showed in brief a general inflammation of the meninges of the brain, most severe at the base, with a large formation of lymph there. From the arachnoid covering the under surface of middle lobe on the right side, was a morbid growth resembling granulations: from the arachnoid of the right lobe of cerebellum was a similar growth through which the 9th, 10th, and 11th nerves passed; the 12th nerve was not implicated. A similar and larger mass covered the whole surface of the dura mater over the petrous portion of the right temporal bone, filling nearly the whole of middle fossa of skull and passing through the foramen ovale, carotid foramen and foramen rotundum to out-

side of skull. The lateral sinus was implicated in a similar growth and apparently obliterated. The tissues of the neck and around the ear were infiltrated with a purulent, grumous matter. The inner table of skull on right side was roughened as in the first stages of caries. A small portion of 12th nerve, external to the skull, was examined microscopically and found entirely degenerated, no normal fibres being seen; this being probably due to the pressure of the inflammatory products where the nerve had its exit from the skull.

The right temporal bone was removed and dissected. On removing the roof of the tympanic cavity, a polypus was seen attached to the promontory, and projecting into and filling the osseous meatus. The tympanic cavity contained much thick pus. No traces of any of the ossicula could be discovered. The internal ear was opened by sawing through the petrous portion of the temporal bone; the vestibule, cochlea and semi-circular canals were filled with a red, solid flesh-like mass, the membranous structures having been thus changed. The mastoid cells were filled with thick pus, and carious.

The mass described above on the dura mater projected slightly into the meatus internus, and also into the aqueductus vestibuli. The polypus grew from the whole surface of the promontory, and was attached to no other part of the tympanum. The granulations of the meatus, seen a few days before death, had entirely disappeared, and the whole internal surface of that passage was denuded of periosteum, and carious, and almost the whole anterior wall had disappeared. The walls of the carotid artery and jugular vein were thickened, but these vessels were pervious and contained no thrombi. The lateral sinus was not affected.

After maceration, the extent of the caries could be better seen. The entire wall of the meatus was carious, and a large part of the anterior wall had disappeared. The temporal bone, for the extent of one-half an inch around the meatus and the roots of zygoma were carious, being honeycombed by minute openings. The glenoid cavity was slightly carious,

as was also the superior surface of the petrous bone, and the wall of the lateral sinus. At the entrance of the aqueductus vestibuli, was a considerable loss of bone from caries. The walls of the carotid canal were carious. The entire floor of the tympanic cavity had been destroyed by caries, and no traces of the jugular fossa existed.

A miscroscopic examination of the masses attached to the dura mater, by Dr. J. C. Warren and myself gave a regular and imperfectly defined net-work of connective tissue, consisting of fibres mixed with numbers of small round cells, such as are seen in ordinary inflamed tissue; in the meshes of this stroma were larger cells, whose shape and appearance could not be made out, as the preparation had been hardened.

An examination of the polypus showed only a sarcomatous growth, such as is generally found in polypi from this position. The growths from the dura mater and the labyrinth were considered the result of inflammation, but their high organization is worthy of observation.

III. T. M., clerk, aged 22; was first seen by me on May 27th, 1870. At that time he was suffering from a purulent inflammation of the right tympanic cavity, with a small perforation of the membrane: the mastoid cells were likewise inflamed, and over them was a small abscess which had opened spontaneously a few days before. With a probe no caries could be felt.

He was prescribed for, and ordered to report in two days. He was not seen again till June 22d, when he reported that he had been confined to the house with severe pain in ear and head, and had been unable to work for four weeks. He was much emaciated, and was complaining of very severe pain in right ear and side of head. There was a free discharge of pus from the meatus; after cleansing, the membrana tympani was seen to be somewhat inflamed, and with a small perforation through which air could be blown by Valsalva's method. Over the right mastoid was a red, fluctuating, and painful swelling, size of a hen's egg. He was

immediately taken into the hospital; and, under ether, Dr. Thaxter made an incision two inches long in the abscess, evacuating a quantity of laudable pus; the incision was prolonged through the periosteum, but no bare carious bone was discovered. From this time I saw him occasionally, with Dr. Thaxter.

On the 23d, the next day, the pain in ear was inconsiderable. Syringing, and the instillation of sulphate of zinz, gr. ij. ad ʒi. ordered for the tympanum.

27*th.* — The discharge from meatus was diminishing, but there was some pain and tenderness over the mastoid. ℞. Tr. Ferri Muriatici gtt. x. t. d.

July 1*st.* — The inflammatory induration from mastoid was extending down neck, but was not tender. Appetite improving; wound healing.

6*th.* — He was first reported to complain of periodical pain and tenderness over occiput, coming on at 6 P. M. Wound over mastoid closing. Pulse 94. Was ordered Quinine, gr. viij. in gr. ij. doses, in the afternoon.

8*th.* — Less pain and tenderness over occiput. The induration of neck had extended further towards opposite side, was red, sensitive, but without fluctuation. P. 84. Some swelling of eyelids. Urine normal. Appetite good. On account of constipation an enema was ordered.

14*th.* — The swelling of neck had increased in size, was painful, fluctuating, and gave him difficulty in swallowing. P. 100.

Under ether, an incision 1½ in. long was made below right mastoid, and a considerable quantity of pus evacuated. Another incision 1 in. long was made on the anterior edge of mastoid and pus again found; through the two wounds a seton was then passed. The pus was found to have burrowed quite extensively in the neck.

16*th.* — Pain in neck entirely relieved since operation. The occipital pain however continues, requiring subcutaneous injections of sulphate of morphine, gr. ⅓. The sputa for several days have been noticed to contain pus, probably due

to the discharge of matter from the ear through the Eustachian tube, as examination of the lungs by Dr. Knight reveals no disease there.

For the next week the pains in the occiput were very severe at times, usually much worse about 4 P. M. Relieved by morphine subcutaneously. The general condition became worse. The pulse varied from 84–94.

On the 27th, he began to improve again; and on 29th pain in head was much less; he could sleep without opiates, and was able to walk about the ward. The seton was removed.

Aug. 2d. — The pain in occiput again returned, of the same character as before; on the 6th it had extended, and was referred to the whole surface on both sides, from occiput to forehead. ℞. Syr. Ferri, Quiniæ et. Strychniæ, ʒj. t. d.

The condition of the ear had, apparently, somewhat improved; the inflammation and discharge were less; there was no pain in the ear; the wound over the mastoid had healed without any caries having been discovered; the perforation of the membrana tympani remained as at first.

On account of my absence from the city I did not see him after this, and the remaining history is from the hospital records.

The pain in the head increased, and by the 14th he required subcutaneously, morphine gr. $\frac{1}{3}$ and atropine gr. $\frac{1}{50}$. Pulse varied from 68–90. Strength continued fair. He then began to complain of a tender spot over occipital protuberance, and after each meal vomited. Was ordered brandy and egg-nogg.

By the 23d $\frac{2}{3}$ gr. morphine were required to relieve pain. A small tumor, size of a pea, which had formed above occipital protuberance was incised, and a minute quantity of pus evacuated. The wound over mastoid had healed.

℞. Ext. Aloes, Alcoholic.
" Belladonnæ, āā gr. $\frac{1}{4}$, daily.

27th.— Pain in head and vomiting continued. Pulse 80, regular. Only liquid diet could be retained.

℞. Iodoform.
Ferri Carbonatis, āā gr. ij. t. d.

Sept. 1*st.* — Pain in occiput much increased. The wound in the neck which had closed to a mere sinus, but had continued to discharge freely, then became dry ; a probe could be inserted for two inches, but no caries could be felt. P. 90.

4*th.*— The pain in head had much increased during last three days. At two P. M., was found in a semi-comatose condition, but moving continually. Pupils sluggish and contracted. Pulse 80. Respiration 10.

Evening.—Moaning and vomiting often. Comatose. No pulse at wrist. General tonic convulsions, lasting ten minutes, and then died. No autopsy.

On being received into the hospital, he was apparently suffering from a very severe inflammation of the middle ear only, with abscess over the mastoid; the brain symptoms were not present. On opening the abscess the bone was not softened or carious, nor did it become so later. The inflammation in the ear seemed to be doing well, the pain was very much less, and the discharge from the tympanum was diminishing till fifteen days after entrance when, without any appreciable change in the ear, he began to complain of pain in the occiput, which seemed to yield to quinine, and was thought at the time to be neuralgic. Inflammation in the neck followed. The occipital pains returned for ten days, then ceased so that he was about the ward. The pains then returned all over the head, accompanied by vomiting; both these symptoms continued, the pain increased rapidly in intensity during the last few days of life, and he died in general tonic convulsions, eleven weeks after entrance. His strength continued fair till one week before death, when it failed rapidly.

The diagnosis would seem to be either meningitis or abscess of the brain, the purulent matter probably penetrating in some of the ways to be described.

IV. T. A. F., aged 21, had always been considered healthy, with the exception of occasional trouble in right ear, to which he had paid little attention. The early history of the ear

disease is imperfect. For fourteen years he had had occasional pain and discharge; two years ago, at the same time that there was a discharge from the meatus, an abscess formed behind the ear, was opened and healed. For four weeks before entering the City Hospital he had been confined to the bed from very severe pain in head and ear, attended by great prostration; there had also been a purulent discharge from the meatus. A few days before entrance, a large polypus had been removed from the meatus.

On April 7th, 1870, he entered a private ward of the hospital under the care of Dr. J. G. Blake. He was then very weak and much emaciated; in bed, complaining of severe darting pains over right side of head, with constant headache on right side. There was a purulent discharge from the meatus and some swelling below and around auricle. His intellect was clear. Pulse 70, regular. Tongue coated. No appetite. Bowels constipated.

Ordered ice bag to head. Ear to be kept clean by syringing Bromide of potass. gr. xx every three hours. Liquid diet.

8th. — Pain same. The bromide was omitted and chloral hydrate, gr. xx every three hours, ordered. The polypus had grown so rapidly as to be seen externally, and the swelling around the ear was increasing.

9th. — I saw him in consultation with Dr. Blake. The whole meatus was then completely filled with a firm polypoid growth, and it was immediately proposed under ether to remove this as thoroughly as possible. The patient's mother refused her consent, however, and would only allow the removal of the external portion without any anæsthetic. This was done and the growth cut off with the wire snare at about the middle of the meatus, and the remainder touched with nitrate of silver. An instillation of sulphate of zinc gr. v. ad ℥j., and three leeches on the swelling below the ear were ordered.

10th. — The swelling and tenderness below the ear were much diminished. Headache continued severe, but the

patient was less dull and stupid and the appetite was very much improved.

12*th.* — The pain in head continued as severe as ever, and morphine subcutaneously was ordered (gr. $\frac{1}{3}$ *p. r. n.*)

13*th.* — Some relief to headache from the morphine. Some redness and swelling of lobe of ear and over mastoid. Polypus grows as fast as it can be destroyed by the caustic, and there is a free, very offensive purulent discharge from the meatus. Poultice over mastoid.

15*th.* — Has become much more dull, aroused with difficulty, but intelligence fair. Appetite again good. Pulse 80, of fair strength. Tongue coated, but moist.

18*th.* — Little brighter, but more restless. Less headache. Takes nourishment well. Some cough with slight expectoration.

20*th.* — Distinct fluctuation behind ear, and by incision ℥ss. pus evacuated; a probe passed in to the depth of two inches and the bone was felt to be extensively bare.

22*d.* — Very little pain in head or ear. Eats well. Bowels regular. Pulse 80, dicrotic. Only semi-conscious, gets out of bed, and walks about staggering. Discharge from wound entirely ceased: that from meatus diminished. With the probe the walls of the meatus were entirely denuded and probably carious. As a last resort in consultation with Drs. J. G. and C. J. Blake, it was proposed to establish an opening through the mastoid cells with the tympanic cavity, remove the whole of the polypus and so get a free communication through which water could be syringed and the pus washed out. This was refused by the mother, and the patient removed from the hospital the same day.

As I learned from the attending physician, the brain symptoms became more marked; he lost consciousness, became weaker, and without any chills, nausea, vomiting, convulsions, or paralysis, died on the fourth day after leaving the hospital. No autopsy was allowed.

For the specimen of the next case I am indebted to Dr.

Geo. E. Francis, of Worcester, who made the autopsy. The history is imperfect; the following are all the facts that could be obtained: —

V. A man, aged 25, subject to catarrh, and called by the family scrofulous. For two years he had been subject to what was called "abscess of the ear," resulting in the discharge of pus, which would last some weeks, and which was attended by deafness of both ears. Two months before death he consulted Dr. H. Clarke, of Worcester, for deafness so extreme that communication by writing was required. Shortly after, he showed cerebral symptoms, dizziness, headache, double vision, and partial paralysis; but of what regions is unknown. He was confined to his bed, and the hearing power is reported to have improved somewhat. He died comatose, and at the autopsy a collection of pus was found in the brain, just over a carious spot communicating with the tympanum. The pus lay directly upon the bone.

On laying open the bone a sinus was found through the upper osseous wall of the meatus, just above and external to the small process of the hammer. This opening was large enough to admit the point of an ordinary probe, and communicated with the meatus externally, and with the small cavity in front of the head of the hammer internally. From this cavity it passed backwards and inwards towards the mastoid process, into a circular cavity about ¼ in. in diameter in the cancellated structure of the bone, and the roof of bone over this cavity had entirely disappeared, so there was a direct communication with the brain. All the walls of this cavity were irregular and carious. The membrana tympani was entire and apparently healthy, of normal transparency and thickness in every part below the small process of the hammer. From the manner in which the bone had been opened the insertion of the upper edge of the membrane had been removed, so that it was impossible to speak of the condition in which the so-called membrana Shrapneli was, whether whole or perforated. The head of the hammer and the whole incus were wanting, but whether lost from disease, or during the dissection, cannot be said.

The point of interest in the case is the peculiar caries of the bone, associated with an unperforated and apparently healthy membrana tympani, the caries in the cancellated structure of the bone having destroyed the wall of the meatus on one side, and the roof which separated it from the brain on the other, and yet not having communicated with the tympanic cavity, or injured the membrana tympani.

The possibility of such accidents as occurred in this case can be easily explained by looking at sections of a normal bone, where it will be seen that but a thin lamina of firm bone separates the cancellated structure from the cavity of the skull on the one side, and from the meatus on the other. The small cavity, a part of the tympanum, above and external to the head of the hammer, it will be seen is separated from the meatus by an extremely thin lamina of bone; and within two years Tröltsch has directed especial attention to this cavity by a specimen which he dissected, and in which he found this plate of bone perforated, and through the perforation a polypoid growth from the mucous membrane projected into the meatus.

That a purulent inflammation of the tympanum could be fatal, without perforating the membrana tympani, was proved in a case of Tröltsch's, in which the roof of the tympanum was opened, and a fatal meningitis set up, and yet the membrana tympani remained entire. This case which I have described is, however, as far as I know, the only one recorded where a caries communicating with both the meatus and the brain had proved fatal without injuring the membrana tympani, and is of importance when we consider how little would have been seen during life by examination, and how necessary it is to bear in mind the possibility of such perforations of the wall of the meatus in searching for the source of a purulent discharge in the meatus.

REMARKS.

That a purulent discharge from the ear might in some rare cases cause necrosis of the bone in which that organ is im-

bedded, and that this necrosis might cause fatal trouble in the brain, has been recognized for a very long time by pathologists. That such a purulent otitis might become the direct cause of death without the bone becoming diseased, has been known only of late years. The dissection of pathological specimens has, however, shown that necrosis is not the only thing to be feared in these cases, but that even if the petrous bone is unaffected, the disease of the ear may be the direct cause of death.

The anatomical relations of the ear, as shown by the most recent investigations, prove that the ear is in more intimate connection with the brain and other important parts than had been supposed. By means of the microscope and fine injections it has been shown that the numerous small foramina with which the petrous portion of the temporal bone is perforated, furnish passages through which an inflammation may extend *ex contiguo* to other parts.

The whole upper and inner surfaces of the bone lie in direct contact with the meninges of the brain, being covered with the dura mater which here serves as a periosteum and nourishes the bone. Part of the upper surface forms the roof of the tympanum, is variable in thickness, but frequently so thin as to be nearly transparent.

The lateral sinus, a fold of the dura mater, and like it serving as a periosteum, is only separated from the mastoid cells by a thin lamella of bone through which many minute foramina pass directly into the cells. These mastoid cells form part of the tympanum. The facial nerve, in its Fallopian canal passes directly through the tympanum; is never separated from that cavity by more than a very delicate bony plate, and frequently from a deficiency in this, probably due to an arrest of development, lies in direct contact, with the mucous membrane lining the tympanum.

The floor of the tympanum is formed by the jugular fossa, in which lies the internal jugular vein; in this floor is a foramen, through which a branch of the vagus passes into the tympanum. Occasionally here, also, from an arrest of

development, the coverings of the jugular vein lie in direct contact with the mucous membrane of the tympanum. The anterior wall of the tympanum is formed by the carotid canal, is so thin that light passes readily through it, and is moreover perforated by foramina, through which the tympanic branches of the sympathetic pass from the carotid plexus to the tympanum.

The meatus internus gives a large canal from the cavity of the skull to the labyrinth of the ear, and this latter is only separated from the tympanum by the thin membranes covering the fenestræ, ovalis and rotunda. This large passage is lined by a prolongation of the dura mater, which serves as its periosteum. The aqueductus vestibuli also connects the interior of the skull with the cavity of the labyrinth, and serves for the passage of a small vein.

The petrosal-mastoid canal leads from the mastoid cells to the interior of the skull, thus furnishing still another communication from a different part of the tympanum to the brain. It serves for the passage of a vein which has been followed into the superior petrosal sinus so that we have here the circulation of the tympanum in direct communication with that of the meninges of the brain.

Without speaking of the different forms requiring various modifications of treatment, all of the serious otorrhœas consist essentially of a purulent inflammation of the mucous membrane lining the tympanum with a marked tendency to ulceration. This ulceration may, and usually does destroy the membrana tympani, making the meatus and tympanum one cavity, and it may destroy either or both the membranes of the fenestræ leading to the labyrinth thus exposing that cavity. From these two cavities, tympanum and labyrinth, we have seen that there are various avenues leading to the brain and other important parts. The ulceration is liable to attack the bone, causing absorption; and we have seen that but a very thin osseous plate separates the tympanum from the carotid canal, the jugular vein, the transverse sinus, and the facial nerve, and these bony plates, even in their normal condition, are perforated by foramina.

An examination of the recorded cases shows that all of the relations of the ear which I have mentioned are attended with danger. By far the most frequent accident seems to be a perforation of the thin roof of the tympanum and the extension of the inflammation *ex contiguo* onto the dura mater, causing a meningitis or suppuration of the substance of the brain directly above the perforation. The penetration of the purulent matter into the labyrinth by ulceration through the fenestræ and thence along the meatus internus or aqueductus vestibuli, is also a not infrequent cause of meningitis or abscess of the brain. Tröltsch moreover records a case where a fistula had been produced by ulceration directly through the bone from the tympanum into the labyrinth, without destruction of the membranes of the fenestræ, and thence the inflammation had extended to the brain, the patient dying of meningitis of the base.

The petrosal-mastoid canal would undoubtedly on examination be found a more frequent source of communication than is supposed. Voltolini has described a case, fatal from purulent meningitis, in which this canal was much enlarged from inflammatory softening and the dura mater around it intensely inflamed. He was not at that time aware that this passage conveyed a vein to the petrosal sinus, and no mention is made of the condition of the sinus. Tröltsch has also given a case where the inflammation extending along this passage had caused phlebitis of the superior petrosal sinus, and this had given rise to a pachymeningitis and two abscesses in the brain.

Occasionally the transverse sinus becomes inflamed from the mastoid cells, and Tröltsch found this sinus filled with a thrombus which had led to metastasis in the lungs. Hæmorrhage from this sinus, either external into the tympanum and meatus or internal into the cavity of the skull, has occasionally occurred from an extension of an inflammation from the mastoid cells, and Wreden has described a case fatal from two perforations of this sinus, through one of which the hæmorrhage was external and through the other internal; he

has likewise given a synopsis of eighteen such perforations from various authors.

An inflammation of the jugular vein may occur in the same manner as in the transverse sinus, the inflammation extending from the tympanum through its floor to the jugular fossa. In Virchow's lecture-room some years ago, I remember seeing a very marked case of this kind, where the floor of the tympanum was largely perforated and the internal jugular vein intensely inflamed and filled with a large thrombus which had led to metastatic deposits in different internal organs. The inflammation here may also take an ulcerative form, and the vein thus be perforated, causing a venous hæmorrhage through the external meatus or Eustachian tube.

The carotid artery is liable to the same injuries as the jugular vein and transverse sinus. It has been found inflamed and obliterated by a firm clot, and quite a number of cases are reported where it has been perforated, and the patients have died from arterial hæmorrhage. In a few cases where such a hæmorrhage occurred and the lesion was diagnosticated, ligature of the common carotid was performed with success.

Affections of the facial nerve from inflammation of the tympanum are by no means rare; the absence or perforation of the thin plate separating the Fallopian canal from that cavity, allowing the inflammation to extend along the sheath of the nerve, or else allowing the swollen mucous membrane to press directly on the nerve, causing a paralysis of all the parts supplied by it. So far as I know, however, no cases are reported of an extension of the inflammation along this passage to the brain.

In addition to these different forms of disease in which the connection with the ear can be distinctly traced, it is now generally accepted that any suppuration may be the exciting cause of pyæmia, and that an inflammation of the substance of a bone is especially liable to lead to this. One or more abscesses in the brain, remote from the ear and surrounded by healthy tissue are sometimes found, for which no other

cause than a suppuration of the ear can be discovered, and Tröltsch with other writers have considered that the circulation was the channel which carried the exciting cause of the abscess, be it a minute embolus or putrid matter, from the ear. On this subject Tröltsch remarks : —

"Not only the true diplöe, but the bone of the os temporis in general is in direct connection, by means of its blood-vessels, with the dura mater on the one hand, and with the soft parts of the ear on the other. The temporal bone in general receives its vessels from within and from without, and also sends them in both directions, not only to the dura mater, but also to the membranes lining the outer and middle ear. Diseases of the latter produce abnormal conditions in the bone and its vessels, which either through the contents, or along the tissue of the walls of the blood-vessels pass onto the dura mater, and there call up secondary pathological processes. These announce themselves in the one case as purulent inflammations of the brain membranes or of the walls of the sinuses, in another by clot-formation and closure of the caliber of the vessels, or by the entrance of putrid matter into the circulation. That all these processes developing themselves within or on the vessels, can be produced by the purulent inflammation of the soft parts of the ear without the existence of a 'caries of the petrous bone' cannot often enough be impressed upon the practitioner, since many are inclined to fear only a 'caries of the petrous bone,' not, however, a simple otorrhœa or purulent inflammation of the soft parts of the ear."

In reply to numerous inquiries for the earlier numbers of the Transactions of the Society, it should be stated that only the Minutes of the first meeting, 1868, were printed, as there were no Transactions; that the Transactions of the second meeting, 1869, were printed and bound with those of the American Ophthalmological Society of that year, and the edition is exhausted. The Transactions of the other meetings have been published separately in paper covers, and can still be obtained of the publishers. The present number (1875) begins the second volume.

TRANSACTIONS

OF THE

American Otological Society.

FIFTH ANNUAL MEETING.

NEWPORT, R. I., JULY 17, 1872.

BOSTON:
ALFRED MUDGE & SON, PRINTERS, No. 34 SCHOOL STREET.
1872.

MEMBERS OF THE AMERICAN OTOLOGICAL SOCIETY.

Dr. Frank W. Abbott.....Buffalo, N. Y.
Dr. C. R. Agnew.....New York City.
Dr. Rob't M. Bertholet .....Philadelphia, Pa.
Dr. C. J. Blake .....Boston, Mass.
Dr. A. H. Buck.....New York City.
Dr. Chas. H. Burnett.....Philadelphia, Pa.
Dr. J. Solis Cohen .....Philadelphia, Pa.
Dr. John H. Dix.....Boston, Mass.
Dr. Samuel L. Frank .....Baltimore, Md.
Dr. J. Orne Green.....Boston, Mass.
Dr. John Green.....St. Louis, Mo.
Dr. Chas. E. Hackley.....New York City.
Dr. J. H. Hinton.....New York City.
Dr. E. L. Holmes.....Chicago, Ill.
Dr. H. Knapp.....New York City.
Dr. J. W. Lawson.....Syracuse, N. Y.
Dr. W. J. Ludlum.....New York City.
Dr. Arthur Mathewson.....Brooklyn, N. Y.
Dr. W. W. Morland.....Boston, Mass.
Dr. H. G. Newton.....Brooklyn, N. Y.
Dr. Henry D. Noyes.....New York City.
Dr. J. F. Noyes.....Detroit, Mich.
Dr. Charles J. Pardee.....New York City.
Dr. Howard Pinkney .....New York City.
Dr. George B. Pomeroy.....New York City.
Dr. O. D. Pomeroy.....New York City.
Dr. Thos. R. Pooley.....New York City.
Dr. J. S. Prout.....Brooklyn, N. Y.
Dr. C. E. Rider.....Rochester, N. Y.
Dr. C. A. Robertson.....Albany, N. Y.
Dr. D. B. St. J. Roosa.....New York City.
Dr. W. W. Seeley.....Cincinnati, O.
Dr. Samuel Sexton.....New York City.
Dr. H. L. Shaw.....Boston, Mass.
Dr. Francis Simrock .....New York City.
Dr. H. N. Spencer .....St. Louis, Mo.
Dr. George Strawbridge.....Philadelphia, Pa.
Dr. R. F. Weir.....New York City.
Dr. Robert Willard.....Boston, Mass.

THE AMERICAN OTOLOGICAL SOCIETY. MINUTES FOR 1872.

The Fifth Annual Meeting of the Society was held at the Ocean House, Newport, R. I., July 17th, 1872, at 11 1-4 o'clock.

Present: Drs. W. W. Morland, of Boston; Frank W. Abbott, of Buffalo, N. Y.; C. J. Blake, of Boston; O. D. Pomeroy, of New York; Henry L. Shaw, of Boston, and J. Orne Green, of Boston.

In the absence of the President, Dr. Morland was chosen Chairman.

Drs. Morland, Blake, Pomeroy, Abbott, and Shaw, were appointed a committee on the nomination of new members, and reported the names of Drs. J. Solis Cohen, of Philadelphia; Chas. H. Burnett, of Philadelphia, and George Strawbridge, of Philadelphia, all of whom were duly elected, and Drs. Cohen and Burnett took their seats as members.

The Chair appointed Drs. Pomeroy, Abbott, and Shaw, as the Executive Committee.

The Treasurer's report was read and referred to Dr. Blake as an Auditing Committee, who reported it correct, and it was accepted.

Notice was given of a proposed amendment to the By-Laws, substituting three instead of five as the number of the Committee on Nominations.

The following bulletin of business was submitted by the Executive Committee, and the papers read in order, and referred to the Publishing Committee: —

1. Report on the Progress of Otology. By C. J. Blake, M.D., of Boston.
2. Accidental Evulsion of the Membrana Tympani and Ossicles. By Chas. H Burnett, M.D., of Philadelphia.

3. Clinical Contributions: Otitis Media Hemorrhagica. By D. B. St. J. Roosa, M.D., of New York.
4. A Case illustrating the Effects of Quinine upon the Ear and the Etiology of Inspissated Cerumen. By D. B. St. J. Roosa, M.D., of New York.
5. Examination of 100 Cases of Impacted Cerumen, with a view of determining its Pathological Indication. By O. D. Pomeroy, M.D., of New York.
6. A Case Presenting a Mastoid Sequestrum. By O. D. Pomeroy, M.D., of New York.
7. A Faucial Eustachian Catheter. By O. D. Pomeroy, of New York.
8. The Perception of High Musical Notes. By C. J. Blake, M.D., of Boston.
9. Case of Caries of the Meatus. By C. J. Blake, M.D., of Boston.
10. A Middle-Ear Mirror. By C. J. Blake, M.D., of Boston.

Verbal Communications.

11. Remarks on a late publication, in which corpulence is considered a cause of deafness. By W. W. Morland, M.D., of Boston.
12. Cases of injury to the ear from external violence. Six of injury from explosions; three of injury from blows; two of injury from attempted removal of foreign bodies. By J. Orne Green, M.D., of Boston.

A vote of thanks was passed Dr. Blake for the very interesting and laborious report presented by him on the Progress of Otology.

Notice was given of a proposed amendment to the By-Laws, viz.: to insert at the end of the first paragraph of the fourth section these words: "And any member neglecting to pay the annual assessments for three years shall be considered to have forfeited his membership."

At 2 3-4 o'clock, after the reading of the ninth paper, the Society adjourned till 4 1-2 o'clock, P.M.

Second Session.

The Chairman called the Society to order at 4 1-2 o'clock, and the minutes of the first session were read and approved. The reading of the papers was then concluded.

The Executive Committee presented the following list of officers for the ensuing year, all of whom were elected:

President, HENRY D. NOYES, M.D.;
Vice-President, E. L. HOLMES, M.D.;
Secretary and Treasurer, J. ORNE GREEN, M.D.;
Publishing Committee, { R. F. WEIR, M.D., CHAS. E. HACKLEY, M.D.;
Committee on Progress of Otology, C. H. BURNETT, M.D.

The two amendments to the By-Laws proposed at the first session were adopted. It was voted that all papers referred to the Publishing Committee be sent to them before October first, and the proofs of articles be sent to their authors, returnable within one week from the date of their receipt, in default of which return, the paper to be left out of the Transactions at the discretion of the Committee.

It was also voted that when the Society adjourn, it should meet again at the call of the Secretary, on the day preceding the annual meeting of the American Ophthalmological Society.

The minutes of this session were read and approved, and the Society adjourned at 6 1-4 P.M.

REPORT ON THE PROGRESS OF OTOLOGY. By C. J. Blake, M.D., of Boston.

The contributions to Otology during the past year have not increased in proportion to the increase of preceding years. This is markedly noticeable in the small number of the larger publications in German and French, and is in part, unquestionably, due to the disturbing influence of the late Franco-German war; and Germany is pre-eminently the country to which we have to look at present for special contribution to the more distinct branches of medical science. Of the larger works in the German, we may notice especially the new edition of Henle, and the enlarged edition of Roser's [1] surgical anatomy and surgery; in the branch of anatomy, and in physiology, Vierordt's[2] "Grundriss der Physiologie," together with the contributions to comparative anatomy of Hasse,[3] and the monographs of Reichert,[4] Gottstein,[5] and Nuel.[6] In French, we have a goodly volume, "Traité Pratique des Maladies de l'Oreille," by Dr. Miot,[7] of Paris, and the translations of Delstanche,[8] from the German; and Dr. de Rossi [9] supplies a want of his countrymen by the publication of an Italian text-book, "Le mallatié dell' Orecchio." There have been no (complete) works upon this branch of surgery published this year in England, Holland, Belgium, the north countries, or Spain; but in America, we have a new text-book by Dr. Lawrence Turnbull,[10] of Philadelphia.

Professor Roser, of Marburg, in publishing a new edition of his work, has greatly enlarged upon the original design, which was to furnish a convenient hand-book for the student and practitioner, and in this case the enlargement has been an improvement. The second chapter of the first volume of 320 pages commences the subject of surgical diseases of the ear. A concise description of the anatomy of the ear,

with especial reference to surgery, is followed by a description of the diseases of the external and middle ear, together with the means of treatment and the use of instruments em ployed. For a work on general surgery, the part devoted to Otology is particularly clear and of eminent practical value to the aurist as well as to the general surgeon.

Dr. Hagen, of Leipzig, publishes one of a series of "Gesundheitsbücher," the object of which is to give general information on matters of hygiene, which will be of value not only to the public but to the practitioner. Any one who has attempted to write for or lecture to the laity on a medical subject, will appreciate the difficulty with which Dr. Hagen has had to cope in preparing his book entitled "The Ear in Health and Disease," and would expect that while that portion devoted to the anatomy of the ear would be too elaborate for the general reader, the portion devoted to the care of the ear and the treatment of its diseases, would be hardly full enough for the practitioner. Still, these difficulties have been successfully met, and the result is a book of convenient size, neither too concise nor too prolix, which will serve its purpose in teaching the public to know and appreciate the service of a skilled surgeon, and in inciting the surgeon to look further into a subject of which many practitioners are grossly ignorant.

The fourth and revised edition of Vierordt's Physiology (Tübingen, 1871) presents the work much enlarged and enriched by the additions which the rapid advances in this branch of science render necessary in any work which is to serve as a university text-book. Chapter 18, of 32 pages, is devoted to the sense of hearing, and opens with a general description of the laws governing the origin and propagation of sound waves. This is followed by a short review, — too short, when we consider the elaborate work of Wolf, and the further contributions which it called forth, of the value of the tones in the human voice and the acoustic characteristics of the vowel sounds. The subsequent sections of the chapter, on "Simultaneous Perception of Different Tones,"

"The perception of tones nearly in unison," "Consonant and Dissonant Tones," and "Tones in Combination," are very short, and almost abstracts of the more extended chapters of Helmholz. About ten pages are devoted to the physiology of the ear proper, including the external and middle ear, with the Eustachian tube, and the conduction of sound within the labyrinth. This portion of the work is of more value to the general student for purposes of reference, than to the otologist, for its contributions to our present knowledge of the subject.

The treatise of Dr. C. Miot is a volume of about 450 pages, illustrated by wood-cuts in the text, and colored lithographic plates of the membrana tympani, with a good Index, and a list of works on Otology, taken chiefly from the French.

But twenty-two pages are devoted to the anatomy and physiology of the ear, and then follows the symptomatology and etiology of diseases of the ear and the methods of examination. For purposes of illumination the author prefers artificial light, as being more readily controllable and presenting greater uniformity of color and reflection, in examining the membrana tympani. Miot employs a bivalve speculum, from one handle of which a moveable rod projects horizontally; to this the concave reflector is attached by a ball-and-socket joint. Dr. Miot employs also a bivalve speculum which is opened by means of a set screw. A considerable space is devoted to the description of the use of bougies for dilatation of the Eustachian tube, a procedure which the author holds in favor, and for the accomplishment of which he employs, by preference, the catgut bougie in sizes varying from $\frac{1}{3}$ to $1\frac{1}{6}$ millimetre. To the laminaria bougie the author finds the same objection which has caused its use to be abandoned by the majority of aural surgeons, namely, the irregularity with which it dilates, and the consequent uncertainty as to the possibility of its extraction without grave injury, if allowed to remain too long a time in the Eustachian tube.

In addition to an objective examination of the membrana

tympani and middle ear, Dr. Miot employs a procedure practised by Curtis, Itard, and Wright, but condemned by others, in the use of small stilets, or probes, of various forms tipped with cotton wool for tactile examination, but avails himself thereof only where an objective examination alone does not prove sufficient for diagnosis, and expends considerable ingenuity in the construction of the different forms of probes.

The treatment of the diseases of the auricle and meatus does not differ essentially from that generally employed, and considerable stress is laid upon the importance of general treatment in the majority of these affections. In diseases of the middle ear, accompanied by marked affection of the pharynx and the Eustachian tube, the author makes it a point to look carefully to the condition of the pharynx and nasal passages, directing a degree of attention to this latter point which it is well to bear in mind. In inflammations of the middle ear, both acute and chronic, in addition to local treatment, the same attention is directed to the general condition of the patient, and for purposes of insufflation the author makes use of a long list of different vapors of which it is sufficient to enumerate — carbonic acid, carbonic oxyde, oxygen, the vapors of mineral waters, of iodine, ammonia, camphor, chloroform, acetic and sulphuric ether, and the acetate and muriate of ammonia. In cases of extension of the inflammation to the mastoid cells, Dr. Miot is unhesitatingly in favor of an opening down upon, or into, the mastoid at an early stage, and where trephining is urgently indicated, generally selects a point about twelve millimetres above the apex of the process, and directs the trephine forwards and upwards, — reporting two successful cases in which this operation was employed. To so-called "nervous deafness" but small space is accorded, and the author concludes his book with an enumeration of the various instruments employed for concentrating sound upon the ear.

The work of Dr. Turnbull is a handsome volume of 450 pages, with numerous wood-cuts and a lithographic plate

illustrating the anatomy of the ear. The first twenty pages are devoted to anatomy and physiology, and about the same space to a chapter on acoustics, and a description of instruments to assist the hearing. Under the former heading are given the tables of Dulong and Wertheim, as to the velocity of transmission of sound in various bodies, a knowledge of which is, as the author states, of practical importance to the physician and physiologist. In this connection greater space might advantageously have been devoted to the influence which varying atmospheric conditions have upon the perception of musical tones, most markedly those of the human voice. In connection with the tables of classification, a schedule of the method of investigation in various diseases of the ear, is given, which is of decided practical value to the student. A portion of a succeeding chapter is devoted to a few clear and valuable hints as to the prevention of deafness, and then follows the more exclusively surgical portion of the work. The author quotes largely from foreign sources, so that a portion of the book assumes the character of a compilation, with the advantage of being a judicious one. Considerable space is devoted to the subject of deaf-mutism, and the concluding chapter gives a resumé of the simplest methods of treating the more frequent diseases of the ear. There is, in addition, a bibliographical table, including 440 works relating to Otology, and a full index.

With increased perfection in the means and methods of examination, we are getting with each succeeding year, in such departments as microscopic anatomy and pathology, not only prominent additions to our knowledge of subjects which underlie all our otological studies, but the revision of previous investigations, and the establishment upon a firmer basis of that substructure upon which we have to build our own individual experiments and practice. It is to this class of contributions to otology that the papers of Gottstein, Nuel, and Hasse belong, and as such they deserve and demand careful consideration.

In making his prepartions for the study of the minute

structure and development of the cochlea, Gottstein uses a solution of chromic acid, one part to 2,500 or 3,000, or of hyperosmic acid, one part to 500 or 1,000: the capsule of the cochlea having been opened, the preparation is placed in the solution, and allowed to remain from 24 to 36 hours; a portion of the lamina spiralis is then placed upon the microscope glass, and treated with the same fluid. In this manner, the rods of Corti and the spindle-cells are especially well shown, and can be preserved for some time, if carefully enclosed. To obtain a good preparation of the whole acoustic apparatus, especially of the lamina reticularis, Gottstein recommends the use of the chloride of palladium, one part to 1,000. For good sectional preparations, it is necessary first to harden carefully by immersion in chloride of palladium solution of 1 p. c. for 24 hours, and then, for the same length of time, in absolute alcohol before embedding.

Histogenetically, we distinguish three various structures in the composition of the cochlea: the osseous capsule developed from cartilage; the osseous modiolus, and the partly osseous and partly fibrous structures, of the walls of the scalae developed from the embryonic mucous tissue; the epithelial covering of the cochlear whorls, which include the terminations of the auditory nerve.

With regard to the development of the capsule of the cochlea, Gottstein's observations differ from those of Boettcher* in that he takes the ground, that the cochlear capsule, at first cartilaginous, develops by fusion of the cartilaginous capsule in a manner resembling that of the osseous structure of the petrous portion of the temporal bone; and in support cites the porpoise, in which the cochlear capsule, free and not surrounded by bone, is at first cartilaginous; the calf, in which the remains of cartilage are found in the capsule precisely as in other bones originally cartilaginous; and the cochlea of a child one year old, in which traces of

* Ueber Entwickelung und Bau des Gehorlabyrinths. Dresden, 1869.

cartilage could be followed inwards close to the border of the ligamentum spirals.

The modiolus and lamina spiralis ossea serving to protect and give passage to the nerve present a system of canals of varying size, the osseous walls of which are of a delicate, friable structure, and permeated by openings traversed by numberless small blood-vessels. In all of these openings, as also in the canals giving passage to the nerves, is a retiform tissue that surrounds with its meshes the nerve bundles and the blood-vessels, and in appearance closely resembles reticulated connective tissue, consisting of rounded cells, anastomosing by fine ramifications.

Gottstein observed this structure, not only in the habenula ganglionaris, but throughout the whole modiolus and lamina spiralis ossea, and not only in young persons but in adults, and believes it to be a persisting remnant of embryonic connective tissue, wherein he differs from both Boettcher and Deiters.*

To the investigation of the lamina spiralis membranacea, crista spiralis, lamina basilaris, the author devotes the larger portion of his paper, and the care expended in the investigations, as well as his points of difference from other writers, make it worthy of a review in detail. Though the formation of the crista spiralis varies greatly in individuals of the same species, its outward form is readily determinable; with its interior structure, however, this is not the case, and it has been exceedingly difficult to determine the rôle which the crista spiralis plays in the classification of tissues. Examined in fine sections, we remark at different stages of development, as well as in different animals, various structures to which Lowenberg † has in a measure directed attention. As a constant element there is a peculiar, nearly homogeneous fundamental substance containing numerous stellate cells, and a row of epithelial cells including the upper surface of the

* Untersuchungen über die lamina spiralis membranacea. Bonn, 1860.

† La lame spirale du limaçon de l'oreille. Paris, 1867.

crista. The fundamental substance is not sharply definable from the underlying osseous structure, so that the cells of the latter are traceable into the fundamental substance of the crista; in many cases the latter is somewhat striated and separated from the lamina ossea by a fibrous band. Both Kölliker and Deiters have described these striæ, but the latter considers them abnormal and immaterial, and as being of mechanical origin during preparation of the specimen. Gottstein agrees with Lowenberg, and in part confirms his views with regard to these striæ, and to the appearances of the crista in the latter months of intra-uterine life, when, as Lowenberg has shown, the principal portion of the crista is composed of striated tissue.

After a review of the various opinions of Hensen, Deiters, Henle, and Boettcher, Gottstein considers that the crista may be best described as an osteoide structure, on the ground, not only of the nearly homogeneous basement substance resembling, but not comparable with, cartilage, but also an account of its manner of development.

Embryological examinations leave it without doubt that the crista, simultaneously and in connection with the lamina ossea, proceeds from the intra-capsular connective tissue, so that in this connection it may be considered as a periostal formation. Gradually there develops a substance resembling osseous structure, as described by Virchow, in the formation of the osteoide structure, "a prefiguration of bone, an equivalent of cartilage." (This metamorphosis terminates in the mammalia with the termination of embryonic life; in man, the persistence of a few fibrous bundles bespeaks the periostal origin.)

In regard to the relation which the formation of the crista bears to the epithelium of the ductus cochlearis, Boettcher shows that in the formation of the crista a denticulated structure, arising from the inner wall of the cochlear whorl, extends outwards, pushing the epithelial structure before it. Boettcher says: "The boundary line of epithelium superim posed upon the surface of the projecting denticulated struc-

ture is at first plainly discernible; later on, however, there occurs a blending, and we find that the boundary line between the cylinder cells of the original labyrinthine vessels and the underlying stratum of connective tissue has disappeared.

Gottstein, however, scouts the idea of the blending of heterologous tissues, such as the epithelium of the ductus cochlearis, and the osteoide substance of the crista, and says that the epithelium may be easily removed after maceration in glycerine, which would not be the case were there any blending of the two structures. Whether the persistence of cells between the denticles, which we are justified in considering as epithelial from their relationships to the epithelium of the membrane of Reissner, as well as with that of the sulcus spiralis, is the result of the development of the osteoide substance of the crista beneath it, a portion of the superior structure disappearing and leaving only remnants in the interdenticular spaces, or whether, according to Boettcher, in the development of the denticulated structure, the denticles are pushed forward in the form of processes dividing the epithelium, Gottstein leaves undecided, but brings forward points in support of the former view. Concerning the superior surface of the crista, Gottstein agrees with Boettcher, that it is perfectly smooth, and that the projections and depressions described by other writers are due to faults in preparation. Gottstein further states with regard to blood-vessels, that he has observed them both spiral and radiating. After describing the three strata of the membrane of Reissner, the author proceeds to view the statements of other writers, especially those of Boettcher, with regard to the structure of the middle stratum, that the cells of the upper lamella lie in a homogeneous layer, Gottstein asserting that the homogeneous layer is not a hyaline intercellular substance, but a distinct middle layer, as best shown in preparations treated with nitrate of silver.

Of the various points considered by the author under the headings, Labium tympanicum and Labium vestibularae

cristæ spiralis, that concerning the passage of the nerve is most important. Contrary to the observations of Boettcher, who includes both the upper and lower plates of the labium tympanicum in the formation of the habenula perforata, Gottstein finds the nerve to pass through the upper plates of the labium tympanicum at a considerable distance from the point of its union with the lower plate, and has not been able to confirm the observations of Boettcher, that at a certain period of embryonic life there is a spiral fissure through which the nerve has passage. He furthermore denies the existence of projections upon the surface of the labium tympanicum corresponding to points of passage of the nerve as described by Henle and Kölliker.

All observers have found great difficulty in arriving at anything like satisfactory or uniform conclusions as to the manner in which the nerve fibres unite with the cells lying at the bases of the inner spindle cells upon the habenula perforata. Gottstéin is of the opinion that the nerves enter and pass through the cells, they being genetically equivalent to the inner spindle cells; whether all the nerve fibres, before extending further, pass through these cells, or whether all the cells give passage to nerve fibres, cannot be determined; a number of the cells, however, are found, which are not in connection with nerve fibres. A portion of the nerve fibres, "internal radiating fibres, pass over to the inner spindle cells, but whether they enter the body of the cell or its prolongation, Gottstein could not determine." Another portion of the fibres proceed in a radiating direction between the two inner rods through the centre of the arc of Corti to the outer spindle cells; these "external radiating fibres" are distinguished by their characteristic varicosities. With regard to the spiral nerve fibres, the existence of which has been denied by Boettcher, and which Schultze considered as originating from a change in direction of radiating fibres, Gottstein gives a plate showing these longitudinal fibres in direct connection with radiating fibres at their exit from the canal.

Dr. Nuel, in the same number of Schwartze's Archiv, con

firms some of the observations of Gottstein, and particularly in speaking of these longitudinal fibres, says that they extend spirally between the outer and inner rods for a greater or less distance, and then turning outwards pass between the external rods, beyond which they disappear. They maintain about the same level in their course, that is, just above the basilaris; their points of exit are at the bases of the external rods and not higher. Between the rods they always maintain a more or less spiral direction; some fibres Nuel has observed running in this direction under as many as sixty rods, without turning towards the direction of the radiating fibres.

F. E. Weber,[11] following the investigations of Rüdinger * of the previous year, makes further contributions to our knowledge of the anatomical characteristics of the Eustachian tube. The tensor veli, the larger portion of which passes towards the Eustachian cartilage, being turned aside, reveals a small bundle of fibres underlying it, and sending tendinous prolongations diagonally downwards upon the membranous portion of the tuba. In one preparation, there were in addition two tendinous bundles, a superior and inferior, of the musc. pterygoideus, extending towards the membranous wall and the hook of cartilage, and uniting with the fibres of the tensor, finding their insertion near the union of the osseous and cartilaginous divisions of the Eustachian tube. On the inner side, separated from the tensor by the fascia, and running along the floor of the tuba towards the palate, is the cylindrical levator veli; outwards, the muscle is bounded throughout its whole extent by the fascia salpyngo-pharyngea.

Towards the pharyngeal end of the tuba, the muscle is in contact with the medial cartilage, and is enclosed thereby laterally and externally to a certain extent.

From the pharyngeal end of the cartilage pass the fibres of the musc. salpyngo-pharyngeus, and the levator veli, before reaching the palate, passes through an arch, the outer

* Beiträge zur Anatomie und Histologie der Ohrtrompete. — *Munich*, 1870.

pillars of which are formed by this muscle and the inner by the fascia salpyngo-pharyngea.

The levator palati, on closer examination, is found to consist of two bundles, a larger and a smaller, the latter of which separates from the former at about the middle of its second third. The larger portion of the muscle has a double origin; from the bone and from the movable Eustachian tube at the angle formed by the two, it springs by tendinous fibres from the petrous portion of the temporal bone close to the carotid canal on the inner side of the osseous tuba, while at the same time fibres extend laterally upon the tuba and insert themselves on the under surface of the medial plate of cartilage just at the boundary of the membranous portion. The palatal end of the levator veli, having passed through the arch at the pharyngeal end of the Eustachian tube, divides into two portions, of which one passes to the sutura cutanea of the hard palate, and the other extends itself upon the soft palate, uniting with the fibres of the levator from the opposite side. Weber was not able to confirm the existence of the third group of fibres described by Luschka as accompanying the fibres of the pharyngo-palatinus. From the position of the levator veli in its relation to the palate and floor of the Eustachian tube, Weber demonstrates its office in regard to the change of position and of patency of the tuba during expiration and inspiration. With the elevation of the soft palate and contraction of the levator veli, the muscle presses upwards, pushing the lateral walls of the tuba apart, and giving the opening an outward direction, the opening taking the form of a right-angled triangle, the perpendicular side lying outwards directly opposite the inferior nasal passage, a relation in which the passage of air during respiration has least effect upon sonorous vibrations passing outwards through the intra-tubal column of air.

Rüdinger[12] describes the intra-articular cartilage of the ossicula in continuation of his previous observations, and more particularly the meniscus lying between the proper articular

cartilage, as being in contact not only with the hyaline cartilage, but also with the fibrous capsular band, very much as is the semilunar cartilage in the knee-joint. Various sections showed the limbus cartilagineus to be of variable size, to which variations the meniscus corresponded; within the articulation the intra-articular cartilage is in no case in connection with the surfaces of the hyaline cartilage, except under pathological conditions. The meniscus of the malleus incus articulation is composed principally of fibrous elements. The articular capsule is stretched tightly across the articulation and is inserted in the furrow at the periphery of the cartilage. The existence of an especial synovial capsule must be admitted, though it is not separately demonstrable on section; the synovial capsule in this case, as in many other articulations, is the innermost fibrous layer towards the cavity covered with a flattened epithelium. In many of Rüdinger's preparations, in addition to the fibrous articular capsule, was a fibrous layer of considerable strength passing from the malleus to the incus, not in intimate connection with the capsule, but united with it in a manner analogous to that of the accessory bands of the articulations in the extremities. The observations of Rüdinger in relation to the meniscus are of interest when taken in connection with the studies of Brunner,* who found the articular cavity between malleus and incus to be free. In the incus stapes articulation, the hyaline cartilage follows the contour of the bone, and is thicker at the periphery than in the centre, the cartilage cells fewer towards either surface.

The fibrous capsule is strongest on the posterior side of the articulation, but is very firm throughout its whole extent. In connection with the synovial membrane lining the inner surface of the capsule is a meniscus which does not differ histologically from that of the malleus and incus articulation; it is, moreover, of the same triangular outline, the thicker portion being that in connection with the capsule; between the articulating surfaces it is thinner. Under pathological

* Beiträge zur Anatomie und Histologie des mittleren ohres. 1870.

conditions the meniscus may become attached to one or other of the articulating surfaces, thus giving ground for differences of opinion among observers.

According to the above observations of Rüdinger we may fairly consider both malleus and incus, and incus and stapes, as united by double articulations.

The musc. stapedius, furthermore, is found by the author to be attached not only to the head of the stapes, but also to the articular capsule, and in many cases directly to the processus lenticularis; the action of this muscle then would be not only upon the stapes, but upon the incus, and in such case it would deserve the name given it by Rüdinger, namely, musc. incudo-stapedius. Brunner, in a later paper, confirms the observation of Rüdinger in regard to the presence of a meniscus in the malleus incus articulation, but supports his own previous views with regard to a union between the meniscus and the hyaline cartilage, and, moreover, refers to his work* for a description of the attachment of the musc. incudo-stapedius as given by Rüdinger.

As an appendix to his previous contributions to the anatomy of the osseous external meatus, and to the topography of the membrana tympani, Gruber[13] gives the following observations upon the sulcus tympanicus.

The furrow which is found at the inner end of the meatus, and which serves for the reception of the membrana tympani (sulcus tympanicus), does not lie in a given plane, but has a spiral direction, the anterior end lying more towards the median line, towards the inner wall of the cavum tympani than the posterior end. The two ends of the inner lip of the sulcus tympanicus do not disappear in the superior wall of the inner end of the meatus, but terminate abruptly with a greater or less space between. By the abrupt termination of the inner lips of the sulcus tympanicus, two opposing processes are found, the anterior one of which is always more strongly marked. These two processes, to which Grüber

* Beiträge zur Anatomie und Histologie des mittleren Ohres, p. 24.

gives the name spina tympanica, anterior et posterior,* play an important part in the attachment of the membrana tympani.

Dr. Burnett [14] presents, as a prelude to a further publication upon the blood-vessels of the membrana tympani in man, a paper on the capillary loops in the membrana tympani of the dog, the cat, and the rabbit; in all of these animals he found vessels arising from the periphery, and extending, with more or less uniformity, in a concentric direction towards the centre of the membrane; each capillary then turned upon itself, forming a loop, to return towards the periphery. The same arrangement was found in the vessels running from the malleus towards the periphery; as a result, there remained a portion of the membrane between centre and periphery having fewer blood-vessels. The nerves accompanying the vessels divided in such a manner as to take the loop between the terminal branches of the nerves in the angle formed by their division, and then united with corresponding branches.

Rüdinger [15] substantiates his previous observations on the presence of the meniscus in the articulations of the ossicula, by sections of the malleus and incus in the dog, and gives an illustration of the peculiar formation of the tendon of the musc. tensor tympani in that animal.

In the second volume of his valuable work upon the comparative anatomy of the ear, Hasse [16] presents four very interesting papers. In the first of these, on the morphology of the labyrinth in birds, he refers to the scheme inaugurated in his previous works, especially with reference to the determination of the endings of the nervus acusticus, and lays particular stress upon the importance of comparative anatomy in throwing light upon the subject. The four papers comprise some two hundred and twenty-five pages, and presenting as they do the author's conclusions with regard to many points of controversy, as well as original observations, they demand in justice, and would require a more ample review than could be accorded within the limits of such a paper as the present.

* "Spina tympanica major et minor" of Helmholz.

Hasse traces the terminations of the nerve to the rod cells (Stäbchenzellen), but does not find them in connection with any other cell structure. Anatomical facts show, without question, that the ciliate cells (Haarzellen) are the most important portion of the cochlear apparatus, and that in amphibia, reptiles, and birds they bear a nearer relation, both in structure and in position, to the inner cilate cells of the mammalia. The rods of Corti serve as a support to the ciliate cells.

Waldeyer confirms the assertions of Hasse, with exception of a few points; as for instance, Hasse places the membrana tectoria and the otolith mass in the same category, as a vibratory apparatus; while Waldeyer, on the other hand, according to these structures an equal acoustic value, considers their function to be exactly the opposite, namely, that of a controlling apparatus, the otoliths being mostly small crystals without regular arrangement, suspended in a mucus-like mass, and the mucous consistence of the membrana tectoria lying free like a gelatinous veil upon the cilicate cells would seem in both cases to accord rather with the views of Waldeyer than with those of Hasse. In the third volume of his "anatomische studien," Hasse [17] contributes a very elaborate anatomical and histological description of the auditory organs of several families of fishes, especially of Pleuronectes, Gadoids, Percoidsand, Cyprinoids, which he compares with each other and with the higher classes of vertebrates, in order to elucidate the specific differences in structure and the gradual progression in development of this organ. He begins with a very minute description of the auditory capsule and of the bones connected with this portion of the auditory apparatus. He also gives his method of insulating the capsule and of making the anatomical preparations, and then proceeds to give a description of its internal structure, and compares it with the internal ear of higher animals. The lining of this cavity and its soft parts form, as in all other vertebrates, the semicircular canals, with their ampullae, the vestibular portion, sacculus and utriculus, and

the cochlea corresponding to the same structures in the next higher class, the batrachians. A second reference to the generic differences in shape and position in the four families of which he treats concludes the general remarks, following which the author proceeds to a histological description of the tissues forming the membranous labyrinth, with a minute review of the morphological differences in the families above mentioned.

In studying the distribution of the nerve, Hasse employs for his preparations a solution of $\frac{1}{4}$ or $\frac{1}{2}$ per cent of osmic acid, with very satisfactory results. The single terminal nerve fibres he finds running in parallel directions, without, as has been asserted, the formation of a plexus or of loops.

The paper concludes with some hints as to the physiological functions of the different structures described; but the physiological hypotheses are as obscure as the anatomical descriptions are clear and exact. Four elaborate plates, comprising 52 figures, serve to illustrate the paper.

Dr. Burnett[18] presents a very interesting series of investigations on the mechanism of the ossicula and of the membrane of the fenestra rotunda. These investigations are made with especial reference to the movement of the ossicles and of the fluid within the labyrinth in response to the sonorous vibrations conveyed to the membrana tympani upon fresh temporal bones taken from both sexes, between the ages of 6 and 45 years. In preparing the specimens for observation, the floor of the tympanum was cut away as high as the fenestra rotunda, till it and the promontorium were fully exposed. The preparation was then firmly fastened in a vise in such position as to be readily approached by a microscope, and easily illuminated, and so as to expose the ossicles from below and the membrane of the fenestra rotunda at an angle of 45°; as sources of sound, four organ pipes, respectively of 50, 140, 630, and 1,160 *v. s.* were employed, the sound being conveyed to the meatus by means of a flexible tube.

Upon producing a note upon the pipe thus connected with the ear, the ossicula were seen to vibrate in excursions bear-

ing a fixed relation to each other, at the same time their motion was communicated through the labyrinthine fluid to the membrane of the fenestra rotunda, the excursions of which maintained an almost constant relation of equality with those of the stapes. The excursions, both of the ossicula and of the membrane, varied with the pitch of the pipes, the longer excursions corresponding to deeper tones. The results of the measurements of the excursions of the ossicula and membrane are important, especially where the observations were made under an artificially produced intra-labyrinthine pressure.

One preparation, which in the natural condition did not respond at all to the vibrations of a pipe, the note of which gave 630 *v. s.*, under a pressure of $\frac{1}{60}$ atmosphere, gave excursions of the following lengths: at point of long process of malleus, 0.008 mm.; at point of long process of incus, also, 0.008 mm.; at the head of the stapes 0.004 mm., and at a pressure of $\frac{1}{30}$ atmosphere, one half of the above. In one preparation, in the natural condition tested by a note of 140 *v. s.*, the length of the excursions of the membrane of the fenestra rotunda equalled that of the malleus. From his observations, Dr. Burnett makes the following deductions.

1. The excursions of the ossicula bear a fixed relation to each other. 2. The excursions of the ossicula are communicated through the labyrinthine fluid, to the membrane of the fenestra rotunda. 3. The excursion of this membrane generally equals that of the stapes, but it may equal that of the membrana tympani. 4. The pressure within the labyrinth increased beyond a certain limit causes cessation of the action of ossicula and membrane of fenestra rotunda; this occurs sooner in connection with high than with low notes. 5. If the intra-labyrinthine pressure be removed, or greatly diminished, the ossicula may continue to vibrate, but exert no influence upon the membrane of the fenestra rotunda.

In this connection may be noted the experiments of Mach[19] and Kessel * upon the movements of the membrana tym-

* Versammlung Deutcher Naturforscher und Aerzte. 1871.

pani, ossicula, and intra-labyrinthine fluids, by means of the stroboscopic method, previously described by the former.* The instrument employed consists of a siren, to the axis of which a disk having the same number of openings as the resounding disk of the siren is attached. Through the openings of the former, the ear is observed by means of a microscope, or mirror; the siren being set in motion, the stroboscopic effect is produced. By this means the necessity of attaching rods or other foreign substances to the membrane or ossicula, is obviated, and the parts can be studied in their natural condition. In the experiments mentioned, the basilar membrane of the cochlea was found to make an excursion from the scala vestibuli towards the scala tympani, when the stapes pressed inwards upon the labyrinth. The posterior portion of the membrana tympani was found to make excursions of much greater magnitude than the remainder of the membrane, which, as a whole, reached a maximum of about 615 half vibrations in the second.

The stroboscopic method of examination is certainly very simple and ingenious, and affords a ready means of observation, not only on the cadaver, but in the living subject. Especially applicable to the latter class of experiments is the method of Dr. Berthold,[20] of Königsberg, who has devised a simple and at the same time a very delicate test of the movements of the membrana tympani, and one of wider application than has been claimed for it by its author. The instrument consists of a T-shaped tube, preferably of glass, one end of which is coated with sealing-wax, or other malleable material, and inserted tightly in the meatus; of the two remaining ends one is connected by means of a flexible tube with a gas pipe and the other in the same manner with a gas burner. The column of gas passing from the supply pipe to the burner would be directly acted upon by any vibration occurring within the tube inserted in the meatus, and such vibration transmitted to the column of gas would be plainly visible in the ignited gas issuing from the burner. A vibrat-

* Wiener acad. Anzeiger, 1870. No. 1.

ing body, a tuning-fork, for instance, in contact with the head would communicate its vibrations to the membrana tympani, and thence to the gaseous contents of the meatus and to the flame. The vibrations in such case would be too rapid for direct observation.

Dr. Berthold, therefore, throws the light upon a four-sided reflecting prism, which being made to revolve with greater or less rapidity, gives a wave line easily followed by the eye. Various precautions are necessary in using this instrument to prevent the possibility of an explosive mixture of gas and air within the meatus. While presenting a valuable means of testing vibratory movements of the membrana tympani, Berthold's method is open to some questions with regard to the precision of the results obtained, and the possible influence of vibrations conveyed in other ways than through the bones of the head. The danger of an explosion might be diminished by interposing a sheet of wire gauze between the flame and the mouth of the burner as proposed in the new form of the sensitive flame. Berthold employed various tuning-forks and his own voice in these tests. The human voice, especially in a humming tone, gave clearer figures than the tuning-fork, and the latter gave more distinct figures when held between the teeth than when placed upon the head. Deep tones gave wave lines, the elevations and depressions of which were wider apart than those given by higher tones, while the height of elevation and depth of depression was less with deep than with high tones.

In testing the hearing by means of the tuning-fork, Dr. Urbandschitsch [21] discovered that when held opposite certain portions of the auricle, the perception of the sound ceased. An upright tuning-fork, the ends of the branches being held at a level with the lower border of the tragus, and being passed in front of the ear from the base of the zygomatic process backward, two points are noticed at which the perception of the sound ceases. On a more careful examination as to the location of these two points, it is found that the first corresponds to the lower border of the tragus, and the

second to the opposite point of the helix. In front of, behind and between these points, the perception is perfectly clear, except that the sound becomes fainter on approaching and more distinct after passing them. Holding the tuning-fork horizontally, and carrying it vertically upwards from the lobule, this observation is repeated opposite the crista helicis.

There exist, also, toneless spaces in the form of two small triangles extending upwards, one anteriorly and the other posteriorly. The apex of the first is opposite the lower border of the tragus; from this point the anterior side extends upwards to a point 4 c. m. in front of and on a level with the superior border of the helix, the posterior side of the triangle terminating 1 c. m. posteriorly on the same level. The apex of the second triangle is opposite the termination of the helix, and the diverging sides extend backward towards the occiput, the divergence, a short distance above the superior border of the helix, being from 2 to 3 c. m. The third toneless space comprised only a small surface, between the crista and the helix. These results were found by Urbandschitsch to be the same, if the auricle was covered by the hand or filled with wax. The facts observed by Urbandschitsch are explained by Berthold[22] upon purely mathematical grounds. He declares them to be the simple result of the interference of the waves of sound from the two branches of the fork. Turning the fork upon its long axis will cause the "deaf spots" to disappear; and the sound of a ticking watch is heard quite irrespective of such spots. This experiment, which any one can make, consists in passing the mouth of a tube in certain directions in the vicinity of a vibrating tuning-fork, and listening at the other end of the tube. If the mouth of the tube be small, points will be found at which the sound is entirely extinguished.

A second experiment enables the fact to be appreciated by several persons at once. A bottle, giving the same tone as the tuning-fork, is procured. The fork being set in vibration, is passed slowly over the mouth of the bottle, a tone being

given forth by the latter which ceases at the moment when the first branch passes the inner edge of the mouth of the bottle, and when the second branch is near the opposite inner edge of the mouth; this gives two points corresponding to the tragus and helix of the ear. The bottle may be tuned to the proper pitch by partly filling it with water. Berthold concludes that there are no deaf points in the ear.

Urbandschitsch attempts no explanation of the phenomena which he describes; and with Berthold's statement with regard to the hearing of the ticking of a watch, my own observations, made some time previous to the publication of the former paper, do not agree. If a watch is passed in front of the auricle from before backward, on a level with the meatus, there is one point at which it is most distinctly heard. This point is in a direct line, following the long axis of the meatus, with that portion of the membrana tympani which has been found to vibrate most readily; namely, the post. sup. segment; and in this line, in the majority of cases, the walls of the meatus offer no projections to interrupt the direct passage of vibrations. Opposite the tragus, the ticking of the watch is less distinctly heard, a portion of the sound being reflected away from the meatus by the outer surface of the tragus.

Dr. Woldemar Poorten [23] reviews the theory of Wreden * concerning the origin of the subjective symptoms consequent on the application of the galvanic current, and gives the results of experiments upon himself and others to disprove the theory founded by Wreden upon the supposed action of the current upon the musc. stapedius and musc. tensor tymp. The experiments consisted in the use of Siegle's speculum, by which the membrana tympani was drawn outward and traction made upon the musc. tensor tympani and ossicula, with accompanying relaxation, according to Magnus of the musc. stapedius. Under these circumstances the galvanic current gave precisely the same reaction that it did before the use of the Siegle speculum. From his experiments and a consider-

* Petersburg. Med. Zeitschrift, 1871. Bd. 2. Heft. 4-5.

ation of the anatomical characteristics of the parts especially included in the theory of Wreden, Dr. Poorten concludes that the action of the stapedius ascribed to that muscle by Wreden (namely, the production of intra-labyrinthine pressure by its contraction), is not only not proved but is denied by later observers. That neither the n. facialis, the branch of that nerve passing to the musc. stapedius, nor the muscle itself are directly acted upon by the galvanic current. Subjective symptoms were educed by the action of the current even when contraction of the musc. stapedius was prevented. Both Prof. Politzer[24] and Prof. Gruber[25] present papers upon the subject of anomalies in tension of the membrana tympani. The former describes the processes in the Eustachian tube and middle ear which have an influence in producing changes in position and in the structure of the membrana tympani, together with the symptoms called forth by the loss of proper vibratory power of the membrane, the changes resulting in the relations of the ossicula, and particularly from the secondary contraction of the musc. tensor tympani. By the pressure of the membrana tympani inwards consequent upon closure of the Eustachian tube, and absorption of air in the tympanic cavity, the point of insertion of the muscle must approach the inner wall of the tympanum, and the tendon consequently become relaxed; the result of this relaxation is a retraction and shortening of the tendon, by which the ossicula and membrana tympani are drawn still further inwards, and fixed in an abnormal position. One of the most marked diagnostic facts in such a case of retraction, is the rapid disappearance of any improvement in hearing which may have been gained by the use of the air douche, the tendon having been stretched by the pressure upon the membrana tympani outwards, but retracting again almost immediately.

In the treatment of such cases, Prof. Politzer speaks of his method of hermetically sealing the meatus and of the division of the posterior fold of the membrana tympani, and gives two cases in which the latter operation was performed successfully; in one case the hearing for the watch increasing

from 0 to 2 c. m., and in the other from contact to one third of a metre. Politzer further notes, in describing the use of Siegle's speculum, the effect which condensation of the air in the meatus has upon the circulation in the membrana tympani and in the meatus. In cases of injection of the blood-vessels this disappeared under the atmospheric pressure, and where pain accompanied the hyperæmia, it was much diminished by the same means.

Prof. Gruber has noticed as a secondary result of the retraction of the tendon of the musc. tensor tympani, in many cases, a fatty degeneration of the muscle. In his paper he devotes particular attention to the stretching of the membrana tympani in cases of continued closure of the Eustachian tube, to the objective appearances accompanying such change, and to the value of both myringotomy and myringectomy in its treatment. Both papers are valuable contributions to our knowledge of changes which accompany some of the more frequent affections of the ear. In another paper, Politzer[26] supplements his previous observations on the occurrence of bullae and of small sacs filled with fluid in the membrana tympani,* by a more precise description of the causes and appearances of these formations. They are less frequently the result of a primary inflammation of the membrana tympani than of an acute otitis media with implication of the membrane. The cavity in the membrana tympani is either distinct or in communication with the tympanum; the former is more common in children, a cold in the head being followed by severe otalgia, and the appearance of a pearl-like swelling upon the membrana tympani, generally in the posterior segment. These finally disappear if left to themselves, either by resorption of the fluid or by an emptying of the sac into the meatus or tympanum. In adults the appearance of these sacs may accompany a sub-acute or chronic affection of the middle ear; in such cases they generally communicate with the tympanum. The true sac differs from the simple bulla in that it is more relaxed, is less transparent

* Beleuchtungsbilder des Trommelfells, Wien.

and is generally in communication with the tympanum and filled with mucous or purulent fluid. When they have emptied themselves they may be detected by inflation of the middle ear. They may be formed either by process of exudation within the body of the membrana tympani, with subsequent opening into the tympanum, or by the passage of secretion from the tympanum into and between the structures of the membrane, and in this connection it is interesting to notice that they but seldom occur in the post. sup. segment. An instructive case of the occurrence of a purse-shaped sac communicating with the tympanum is given, in which the usual treatment, consisting of perforation of the sac and the use of the air douche, was followed by most satisfactory results, the hearing for the watch and for the voice increasing from 3 c. m. and 2 m. to 45 c. m. and 16 m., respectively. As a result of the use of Weber's Koniantron, Wreden[27] gives a case of rupture of the membrana tympani occurring in a man forty-two years of age, in whom an atrophied condition of the membrane was accompanied by a high grade of deafness, the watch being heard only on contact, and the voice only in a loud tone close to the ear. The injection of air by means of Weber's instrument was followed by a loud cracking sound and a sudden restoration of the hearing to the extent of 60″ for the watch. An examination revealed a rupture extending across the anterior segment, without any accompanying injection of blood-vessels, and without pain to the patient, the opening and the improvement in hearing remained constant. That which makes the case remarkable is not so much the rupture of an atrophied membrane, for that has probably occurred in the experience of all present, even with the use of the air douche, but the great change in the hearing following a simple rupture, without the presence and removal of secretion in the middle ear.

Dr. Ashurst[28] reports a case of necrosis and general meningitis following otorrhœa in a patient admitted to hospital on account of long standing discharge from the ears, with

destruction of the membrana tympani on both sides and marked diminution of hearing. At time of admission there were no very striking symptoms of meningitis; death, preceded by coma, occurred on the fifth day, and the post-mortem revealed general arachnitis on both sides, above and below, with considerable formation of tolerably recent lymph. There was decided roughness on the inner surfaces of the petrous portions of both temporal bones, and on the left side a small exostosis-like projection had perforated the dura mater. There was no intra-cranial suppuration and no accumulation of pus in the mastoid cells.

Mr. Haslewood[29] also reports a case in which purulent inflammation of the middle ear, of six years standing, resulted in abscess of the brain and death. The petrous portion of the temporal bone was of a bluish-green color, filled with greenish pus and carious bone. The portion of the middle lobe of the right hemisphere of the brain resting against the diseased bone was occupied by an abscess containing an ounce of thick yellow pus. In the neighborhood of the abscess, the brain was much softened, but otherwise normal.

In a soldier twenty-two years of age, who had died of ileo-typhus, Prof. Moos[30] found, in addition to the presence of purulent catarrh of the middle ear, in the labyrinth upon the lamina spiralis membranacea, on the membranous saccules, and on the ampallæ lymphöide bodies, in one case undergoing fatty degeneration. They were very numerous at all of these points, but especially at the point of entrance of the cohlear branch of the auditory nerve. The membranous semicircular canals were, with one exception, free from these bodies. Gruber[31] reports a case of a rare anomaly occurring in the temporal bone, with remarks upon its importance in practical Otology. The patient, a healthy man, thirty-three years of age, having been exposed to stress of weather, noticed, on the night of the day following his exposure, a disagreeable and continuous rushing sound in the left ear. The following morning the sensation was as if

the ear had been plugged, and the hearing was much diminished. Hoping for relief from his trouble, he took a steam bath, which was followed in a few hours by severe pain in the ear, which continued with great increase of the subjective noises for three days, and at the end of that time diminished simultaneously with the appearance of a discharge from the ear. Three weeks later, the discharge having continued, and the ear having received little other treatment than simple cleansing with warm water, severe pain recurred without apparent cause, and accompanied by high fever, the meatus becoming much swollen and extremely tender. With an increase of the otorrhœa the pain somewhat diminished, to return at the end of ten days, when the patient came to Prof. Gruber, who found the following condition. The mucous membrane of the pharynx swollen, of a deep red color, and secreting largely. The outer portion of the meatus, which was covered with secretion, not very sensitive; the inner portion, however, markedly so; the integument swollen, red, and excoriated in spots, this appearance extending over the membrana tympani, which was distinguishable only from its topographical relations, as it presented none of the distinctive characteristics of the membrane. Posterior to the membrana tympani was an opening the size of a pea, having sharply-defined edges; its contour was not easily determinable, but a sound penetrated about four lines from the mouth of the opening, directly inwards, and a little further if directed slightly backwards. Neither Valsalva's nor Politzer's inflation, nor the use of the catheter, gave a perforation sound, and by the latter operation the hearing was only momentarily increased. In addition to the anomalies of development as represented by arrested development of the bony structure dividing the canalis caroticus and sulcus jugularis from the tympanum and the sulcus sigmoideus from the mastoid cells described by Hyrtl, Gruber has paid particular attention to a like defect occurring on the posterior wall of the meatus, at its inner end, close to the membrana tympani, by means of which the soft tissues of the meatus

would be brought into close contact with those of the tympanum and mastoid cells. It is with reference to these observations that Gruber has described this case, which he concludes as follows: —

From the position and other characteristics of this opening, the conclusion would be that it opened a communication between the meatus and the mastoid cells. The opening was certainly not in the membrana tympani, as aside from its position it was surrounded by a bony rim. Caries was much more probable than perforation of the membrana tympani; but, on the other hand, there had been and were no symptoms of such a complication. The original trouble had probably been a catarrhal inflammation of the middle ear, which had become purulent, with copious secretion, and extension of the inflammation to the neighboring tissues.

Being aware of the possibility of a defect at this portion of the meatus, and there being no indication of a carious process, Gruber concluded, rather, that the inflammation having commenced in the middle ear and the membrana tympani remaining intact, it had extended to the point at which the defect in the bone existed, and implicating the contiguous soft parts, made an opening between the middle and external ear. With the passage of the pus through this opening the pain was relieved, while its accumulation in the meatus and the consequent irritation resulted in the second attack of pain. The fact of the variations in the degree of pain further supported the diagnosis, as an exposure to cold or other exciting cause would result in congestion of the soft parts about the opening, and a closure of the passage for the secretion from the middle ear. The treatment, as founded upon this diagnosis, consisted in the use of an alum gargle and the injection into the middle ear of an alum solution of one per cent by Gruber's method, the meatus was simply cleansed as occasion required. At the end of the ninth day, the discharge was so slight during twenty-four hours as hardly to demand the change of the charpie with which the meatus was stopped. The opening was finally closed by

cauterization of its edges, and the hearing became nearly normal.

Jacoby [32] contributes three more to the rapidly lengthening list of cases of perforation and trepanation of the mastoid. The first of these, a chronic otitis media purulenta, with secondary ostitis and periostitis of the processus mastoideus, in a boy ten years of age, resulted much more favorably than might have been expected from the severity of the symptoms.

The second case was that of a man thirty-seven years of age, suffering from purulent otitis media, with partial necrosis of the petrous portion of the right temporal bone. The symptoms urgently indicating the necessity for the operation, the mastoid process was trephined, with the liberation of large quanties of fetid pus, and diminution of the pain, fever, and graver symptoms. Irrigation with hypochlorite of soda and lead solutions, the use of narcotics, and a general tonic treatment, still further improved the condition of the patient. Seventy-five, eighty-nine, and ninety-three days after the operation, sequestra of considerable size were removed, and a few days later, the patient died suddenly. A post mortem was not permitted, and the question as to the cause of death lay between the possibility of an extension of abscess formation to the brain, or the occurrence of œdema resulting from the profuse suppuration which had continued almost unabated since the operation, and by which the patient had become greatly reduced.

The third case, a boy five years of age, having caries of the superior wall of the meatus, with secondary partial necrosis of the posterior surface of the petrous portion of the temporal bone, resulted fatally from the occurrence of cerebral abscess.

Farwick [33] reports two cases of caries of the petrous portion of the temporal bone, the former of which resulted fatally from the formation of cerebral abscess.

The section revealed a cavity of the size of a goose egg in the left hemisphere, filled with thin pus. The apex of this cavity opened at the point where the brain overlies the supe-

rior wall of the tympanum. Removal of the dura mater showed caries of the superior wall of the petrous bone; the osseous lamella was destroyed, and the tympanic cavity, visible, filled with caseous pus, which extended into the mastoid cells. The destruction was greatest on the posterior wall of the tympanum, and towards the meatus where there was an opening in the bone. The body of the incus was also carious, but it retained its position while the membrana tympani, much thickened, was intact, with exception of a very small perforation. The case is worthy of remark from the extension of the trouble inwards, coincident with considerable thickening of the mucous membrane, occluding the Eustachian tube, and the thickening of the membrana tympani, with the presnce of but a small opening for the escape of the purulent secretion, and further as confirming the observations of Prof. Gruber, given in a preceding paper. The second case is of interest from the success of the galvano-caustic in removing the granulations which accompanied a caries of the posterior wall of the tympanum, after the failure of concentrated chromic acid, and other caustics to effect the same result. There was little pain, and no unfavorable symptoms following the galvano-caustic, and its action was in every way more satisfactory than that of the other means employed.

Of the operations in aural surgery, the two which have received most attention during the past year. in addition to that last cited, are, the tenotomy of the musc. tensor tympani, and the division of the posterior fold of the membrana tympani as claimed by both Politzer and Lucae.

Weber,[34] in a prefatory communication, gives the grounds for, and results of the former operation, as follows:—

1. In the majority of cases, it is possible, by means of tenotomy of the tensor tympani, to permanently relieve subjective symptoms (tinnitus aurium) which have resisted other means of treatment.

2. Vertigo, accompanying the subjective symptoms, may also be relieved by the same means.

3. Where this operation has relieved the above symptoms, the hearing may, as a rule, be improved.

4. Tenotomy, furthermore, may prevent progressive diminution of hearing, and enable the patient to retain what remains at the time of the operation.

5. It may also be of service where the retraction of the tendon is not the only cause of increased intra-labyrinthine pressure.

6. After closure of the perforation in the membrana tympani, an examination with the pneumatic speculum shows the membrane to be perfectly free, no longer drawn inwards, and more normal in position.

7. The auscultation sounds on use of the air douche are changed by the operation; a free, full sound is heard accompanying the movement of the membrane.

8. To avoid reunion of the divided ends of the tendon, it is advisable to use the air douche for some time after the operation.

9. The operation causes little pain and is easily performed without anæsthetics.

Among the many cases upon which he has operated, Weber has found the only unpleasant result to be the occasional occurrence of a subsequent neuralgia, which subsided under the use of quinine.

Since his first paper upon this subject,* Weber has operated upon about fifty cases, and has introduced modifications and improvements in both method and instrument. The cutting hook of the tenotome has been somewhat changed from the original pattern, being made broader, more rounded at the cutting angle, and the point of the hook blunted. The hook is joined to the arm at an obtuse angle, and is somewhat thicker at its base, while a cogged wheel and comb are substituted for the movement in the former instrument. In operating, Weber employs a short, wide speculum, and the head rest and mirror described in a previous communication.† The situation chosen for the perforation of the membrane, which is made with the point of the hook,

* Monatschrift für Ohrenheilkunde. 1868. No. 4.

† Monatschrift für Ohrenheilkunde. 1870. No. 5.

is 1–1½ mm. in front of the manubrium mallei, just below the processus brevis. The hook is then pushed into the tympanum, and the handle of the instrument being depressed and carried forwards slightly, the hook passes over the tendon of the muscle. At this point, it is necessary to exercise great care in placing the hook about midway between the membrana tympani and the opposite wall of the tympanum. Slight traction is then made, and the hook, by means of the slide in the handle of the instrument, caused to make a quarter turn forwards, thus dividing the tendon. The division having been completed, the hook is returned to its former position, in order to facilitate its removal through the opening in the membrane.

Further communications are promised in the form of a monograph, which shall give more fully the results of the author's experience.

Gruber * has also reported a case in which he performed the above operation, with relief from subjective noises which had continued for six years, and with considerable improvement in hearing.

Lucae[35] contributes a paper on cases of division of the posterior fold of the membrana tympani, in which, after referring to his observations on this subject in Langenbeck's Archive in May, 1871, made upon 48 cases, he proceeds to describe the condition of the membrana tympani, with special reference to the marked prominence of the posterior fold, accompanied by great concavity of the membrane, and a horizontal position of the malleus, resulting from chronic catarrhal inflammation, in which he considers the operation particularly indicated.

The marked prominence of the posterior fold Lucae considers pathological, and as usually accompanied by diminution of hearing, tinnitus aurium, and sensations of fulness and pressure within the ear. Convinced of the futility of attempting to remedy this abnormal condition by means of the air douche and catheter, the division of the posterior fold was re-

* K. K. Gesellschaft der Aerzte Wien. Sitzung. Feb. 16, 1872.

sorted to. Among the arguments in favor of such an operation was the fact, as shown by Mach and Kessel, that the portion of the membrane in and below the posterior fold responded most readily to sonorous vibrations. So far as the topography of the operation is concerned, even in a narrow meatus, the posterior superior portion of the membrane is much the most accessible, and though the chorda tympani lies in close relation to the posterior fold, with a proper degree of caution, and by making the incision from below upwards, and rather horizontally, there is but little danger of wounding the nerve, as is shown by the success in this respect of the 140 operations which Lucae has performed. Both the pain and the bleeding consequent upon the operation are slight, as a general rule. Out of 109 tabulated cases, 46 were much improved, 39 somewhat improved, and 24 not at all; among the latter are included some cases which subsequently improved under the use of the air douche. As concerns prognosis, Lucae considers it more favorable in cases where the posterior fold is very prominent, and especially in chronic catarrhal inflammation where there are no adhesions, and less so in old persons, with old inflammation of the middle ear, and considerable deafness. The operation should be undertaken, as a rule, only when the Eustachian tube is free.

Löwenberg [36] reports an ingenious method for the extraction of a foreign body from the external meatus. A small ivory ball, from the tip of a porcupine quill pen-holder, was forced into the right ear of a boy nine years of age. Various attempts at extraction made by unskilful hands wounded the meatus, perforated the membrana tympani, and excited severe inflammation. Allowing this to subside, Löwenberg attempted extraction; firstly, by syringing, then by the use of the aural douche, by Valsalva and Politzer's methods, and by the catheter with air and tepid water, all unsuccessfully. The ball was finally extracted, by bringing the point of a small brush dipped in joiners' glue in contact with its outer surface, allowing the glue to harden and then extracting brush and ball together. This case is parallel to one oper-

ated upon by Dr. E. H. Clarke, under very similar circumstances. Finding it impossible to extract the foreign body, a hard, smooth ball, by the ordinary methods, Dr. Clarke passed a thread through a small square of adhesive plaster, and bringing the latter, by means of a fine tube, into contact with the outer surface of the ball, concentrated sunlight upon it with a lens until it softened and adhered, and then extracted it easily.

Weber[37] gives two typical cases of an affection which has not been heretofore recognized as a distinct disease of the middle ear, and to which he gives the name otitis intermittens. The first symptoms were those of a closure of the Eustachian tube, followed by extension of an inflammatory process to the middle ear; namely, diminution of hearing, sensation of fulness, tinnitus aurium and pain, increasing in intensity and extending on to the face on the side affected. These local symptoms were accompanied by chills, followed within a few hours by fever and sweating with great prostration. The pain then diminished somewhat, but the deafness and tinnitus aurium continued. An examination revealed congestion of the inner end of the meatus and of the blood-vessels of the membrana tympani, diminished permeability of the Eustachian tube, and a thin fluid secretion in the middle ear, which later on became slightly purulent, and was removed by catheterization and paracentesis, affording some relief. The pain continued slightly, occasionally increasing, and one month after the first attack returned with great vehemence, accompanied by chills and fever as before. These latter symptoms were repeated at about the same hour on the day following. Quinine was accordingly administered in gramme doses, and from that time the pain and general symptoms subsided, leaving only a slight excess of secretion in the middle ear, which was relieved by means of the air douche.

The explanation of the symptoms may be the exposure to malaria, causing the fever and the severe pain, with consequent exhaustion and the resultant vasomotor neurosis, as exhibited in the congested blood-vessels and the accumula-

tion of excessive secretion within the middle ear. The ready relief from the administration of quinine confirms the diagnosis, so far as its malarial origin is concerned.

Dr. Böke [38] prefaces his table of statistics with a few well considered words on the occurrence of diseases of the ear in children. "We have to deal," he says, "with an organ the lesions of which are followed by much more serious results in children than in adults. The same pathological change which in the adult causes only loss of hearing, in the child prevents it from hearing the voice, and therefore from learning to speak. The mental development is interfered with, and among deaf-mutes there are many who owe their loss to the want of attention to some simple disease of the ear during their earliest years. The anatomical structure of the temporal bone in children, moreover, is such, that in case of pathological change, the symptoms are so complicated as to render a diagnosis, without special examination of the ear, exceedingly difficult." *

It is not uncommon to have delirium and high fever as the result of purulent accumulation in the middle ear, and to have the symptoms disappear on perforation of the membrana tympani and evacuation of the secretion. We often hear the history of such cases, with the added observation, that a discharge has been allowed to continue without treatment, because it was not healthful to prevent it. Out of eighty-four cases of disease of the ear, the majority occurred in males, and between the ages of three and seven years. The explanation of the latter circumstance is found in the frequency of the acute exanthemata with implication of the mucous membrane of the pharynx in children at this age. There were twenty cases of otitis externa, to twenty-eight of otitis media, showing a percentage in favor of the former above that in adult cases, and a majority of the cases of otitis externa occurred before the seventh year. Above the seventh year, they were usually accompanied by disease of the tym-

* Zwei Fälle von Ecclampsie in Folge von Otitis. Böke, Wiener Med. Wochenschr. 1867. Nos. 44–55.

panum. Of twelve cases of total deaf-mutism, eleven occurred in children between the ages of three and fourteen years, and one in a child of one year old. All of these had at one time possessed normal hearing, but had become deaf in consequence of cerebral disease.* The symptoms had appeared suddenly, with severe pain in the head, and delirium, continuing from two to three days, followed by slow convalescence and unsteadiness in walking. The loss of hearing was noticeable from the first appearance of the disease and continued total. Böke considers the cause in these cases to be an epidemic disease of the brain in the neighborhood of the origin of the auditory nerve. The treatment, which consisted in the administration of iodide of potassium, did away with the general symptoms, but had no effect upon the deafness.

In this connection we may notice a third paper on otitis labyrinthica, by Voltolini,[39] both as confirming the observations of Dr. Böke and as throwing further light upon the possible cause of the deaf-mutism in the cases which he cites. Voltolini agrees with the latter, as to the simulation of a meningitis, by the symptoms occurring in an otitis media, and to so great a degree that only the appearance of a discharge from the ear can determine the diagnosis. Should there be no rupture of the membrana tympani, but an extension of the disease to the brain only, a post mortem could definitely determine as to the primary origin of the disease in the ear. In otitis labyrinthica, the case is apparently much the same; the cerebral symptoms appear at an early stage, and are so marked as to justify the diagnosis of meningitis. Within a few days, however, the fever and delirium suddenly disappear, together with the graver symptoms, but the patient is totally deaf. The disease may, however, extend to the brain, and the child die of true meningitis. Three cases presenting much the same characteristics are

* Weber, Totale Taubheit bei Kindern in Folge von Erkrankung des Central nerven systems. Wiener Med. Presse. 1871. No. 6.

given, together with a review of the work of Prof. Knapp,* and the view of Virchow, that otitis labyrinthica may be considered as a distinct disease in children. Voltolini concludes that the disease which he describes is entirely distinct from that of Ménière, the latter being an apoplectic, the former an inflammatory affection; and, furthermore, that it is to be considered as much a distinctive disease of childhood as croup or diphtheria. From the commencement of the attack, the usual antiphlogistic treatment has been proved without the slighest effect.

Wreden[40] reviews the different methods for effecting the instillation of medicated fluids, in disease of the middle ear, and gives his grounds for preference to the tympanic catheter of Weber. His experience in the use of this instrument, however, has taught the necessity of modifying the strength of the solutions employed. The bestresults obtained were from the use of potass. iod. in sclerosis, astringents in catarrhal inflammation, and strychnine, in affections of the auditory nerve. To the latter, Wreden ascribes a specific action upon the nerve.† Dr. Roosa[41] does the profession and the public a service, in further drawing attention to the danger attending the use of the nasal douche, by the report of sixteen cases of inflammation of the middle ear, following its application. In the majority of the cases presented, the patients had proper instruction, as to the care necessary to be taken, and could cases be collected, where the instrument had been employed without medical advice, the list of serious diseases of the ear, as a result, would be largely increased. Dr. Buck reports a unique case of horny growth from the membrana tympani, occurring in a patient who came under treat-

* Analysis of the inflammatory affections of the internal ear. Archives of Ophthalmology and Otology. Vol. 2, No. 1.

† Iodine gr. ¼, ad unciam; Hydr. B. Chlor. gr. ⅛, ad unciam: Argent Nitr., gr. ¼-1, ad unciam; Cupr. Sulph. gr. 1, ad unciam; Zinci. Sulph. gr. 2, ad unciam; Ammon. Mur. gr. 3, ad unciam; Potass. Iod. gr. 5, ad unciam; Strych. Nitr. gr. 5, ad unciam; Atroph. Sulph. gr. 1, ad unciam; Ext. Sem. Physostygmatis venenon, gr. 4, ad drach; Hydr. Chloral, gr. 2, ad drach.

ment for the removal of a mass of cerumen. The upper three fourths of the right membrana tympani was occupied by a flattened mass of a pale, yellow color; it stood out from the level of the membrane to the distance of a line, and terminated throughout its entire lower border with abrupt edges. Along its upper and anterior boundary it became gradually merged in the skin of the auditory canal; its surface was smooth and slippery, and seemed hard on being touched with the probe. Prolonged soaking produced no appreciable change, as would have been the case had the mass been ceruminous.

Dr. Prout[42] proposes a simple and universal formula for recording the hearing distance, which may serve to do away with the prevailing uncertainty as to the value of such records dependant upon the imperfect means afforded by a series of tests with watches, not only of different intensity of sound, but of varying tone. Recording the hearing distance of a patient as a fraction of the normal hearing distance of a given watch, enables other observers, by a simple calculation, to reduce the record to their own standard.

Bonnafont[43] adds two cases to those already published,* where grave symptoms, simulating disease of the brain, were caused in the first case by accumulations within the tympanum, and in the second by inflammation of the membrana tympani, and pressure from granulations upon its outer surface. In both cases there was vertigo, titubation, and general malaise; the symptoms were relieved in the former by catheterization of the Eustachian tube, and in the latter by removal of the growths and appropriate treatment of the myringitis.

The second number of the second volume of the Archives of Ophthalmology and Otology contains, among many valuable papers in both branches of science, a case of ligation of the common carotid artery after gunshot wound, by Dr. Wolf, with diagnosis of the position of the ball from its effect upon the ear, the ball becoming lodged in the left Eustachian tube and exciting symptoms which led to examination of the ear

* Académie des sciences. August 22, 1869.

and of that canal, and revealed its presence. The resulting symptoms give the author an opportunity of illustrating fully some of the observations recorded in his book of the previous year, and which is so valuable a contribution to our knowledge of the physiology of hearing. The work of Prof. Erb demands a careful study; so much so, that an adequate review would include the larger portion of his paper, which, reviewing as it does the comparative statements of Brenner and Benedict, and giving the author's own conclusions, affords a basis for individual investigations on the part of the reader. There have been many other contributions to Otology, most of them, with exception of the report of Prof. Knapp in the Archives, in the form of short lectures, or reports of cases, all of them possessed of interest, which have been merely noticed in this report. It is the increase in number of these shorter communications which proves, more than the publication of distinct works even, the growing interest in a branch of medical science, the importance of which is becoming better appreciated with each succeeding year.

BIBLIOGRAPHICAL RECORD.

JULY, 1871, TO JULY, 1872.

[1] *Roser.* Handbuch der Chirurgie.

[7] *Miot.* Les maladies de l'Oreille. Paris, 1871.

Airey, G. B. On sound and atmospheric vibrations, with the mathematical elements of music. London, 1871.

[9] *De Rossi.* Le mallatie dell' Orecchio. Genova, 1871.

[2] *Vierordt.* Grundriss der Physiologie. Tübingen, 1871.

[3 16 17] *Hasse.* Anatomische Studien. Leipzig, 1872.

Hagen. Das Ohr. Leipzig, 1871.

[10] *Turnbull.* Diseases of the ear. Philadelphia, 1872.

[4] *Reichert, C. B.* Beitrag zur Feineren Anatomie der Gehörschnecke beim Menschen und den Säugethieren. Archiv. für Anat. and Phys., 1871. Hft. 1–2.

[5] *Gottstein.* Beitrag zur Feineren Anatomie der Gehörschnecke. Schulzes Archiv. VIII.

[6] *Nuel.* Beitrag zur Feineren Anatomie der Gehörschnecke. *Ibid.*

Schöbl, J. Das aussere ohr des Igels als Tastorgan. *Ibid.*

[18] *Burnett, C. H.* Untersuchungen über die Mechanik der Gehörknochelchen und über die membran des Runden Fensters. Monatschr. f. Ohrenheilk. V. 7.

[8] *Delstanche.* Paracentese, etc. Paris, 1871.

[11] *Weber, F. E.* Ueber die Beziehungen des musc. levator veli zur Tuba Eustachii. Monatschr. f. Ohrenheilk. V. 8.

[12] *Rudinger.* Ueber die Zwischengelenkknorpel in den Gelenken den Gehörknochelchen. Monatschr. f. Ohrenheilk. V. 10.

Voltolini. Die Gehörknochelchen ægyptischer mumien. Monatschr. f. Ohrenheilk. V. 11.

[13] *Gruber.* Uber den Sulcus tympanicus. Monatschr. f. Ohrenheilk. V. 12.

Brunner, G. Ueber die Verbindungen der Gehörknochelchen. Monatschr. f. Ohrenheilk. VI. 1.

[14] *Burnett, C. H.* Ueber das Vorkommen von Gefässchlingen im Trommelfelle einiger niederer Thiere. Monatschr. f. Ohrenheilk. VI. 2.

[15] *Rüdinger.* Ueber das Hammer-amboss-gelenk und den musc. tensor tympani beim Hunde. Monatscbr. f. Ohrenheilk. VI. 5.

Rüdinger. Ueber die Gelenke der Gehörknochelchen. Monatschr. f. Ohrenheilk. VI. 3.

Voltolini. Der Regenschirm als Trommelfell. Monatschr. f. Ohrenheilk. V. 12.

[19] *Mack.* Wiener Acad. Anzeiger. 1870. No. 1.

[20] *Berthold, E.* Optische Darstellung u. s. w. Monatschr. f. Ohrenheilk. VI. 3.

[21] *Urbandschitsch.* Ein Beitrag zur Lehre von der Schallperception. Centralbl. Med. Wissensch. 1872. No. 8.

[22] *Berthold, E.* Ueber die von Dr. Urbandschitsch anfgefundenen tauben Punktedes Ohres. Monatschr. f. Ohrenheilk. VI. 5.

[23] *Poorten, W.* Anatomisch-physiologische Bemerkungen gegen die Wreden'sche Binnenmuskeltheorie der Galvanischen Acusticusreizung. Monatschr. f. Ohrenheilk. VI. 5.

Burnett, S. M. Recent investigations concerning the function of the cochlea. Philadelphia Med. and Surg. Reporter. Vol. XXV. No. 19.

[25] *Gruber.* Ueber anomalien in der Spannung des Trommelfells. Monatschr. f. Ohrenheilk. V. 7. Zur Casuistic des Trommelfell rupturen und ihren Einfluss auf. das Hörvermögen. Monatschr. f. Ohrenheilk. V. 8.

[24] *Politzer.* Zur pathologie und therapie der Spannungs anomalien des Trommelfells und der Gehörknochelchen.

[26] Blasenbildung und Exudatsäcke im Trommelfell. Wiener Med. Wochenschr.

[27] *Wreden.* Ruptur des Trommelfells. Monatschr. f. Ohrenheilk.

[28] *Ashurst, J.* Necrosis of the skull following Otorrhœa. Philadelphia Patholog. Soc.

[29] *Hazelwood, A. O.* Abscess of Brain following Otitis. Lancet. VII. 1872.

[30] *Moos.* Ueber die anatomischen Veränderungen des häutigen ohr labyrinths beim Ileotyphus. Verhandl. des naturw. Med. Vereins. Heidelberg.

[33] *Farwick.* Zwei Fälle von caries des Felsenbeins. Archiv f. Ohrenheilk. B. VI. Hft. 2.

[32] *Jacoby.* Zur perforation und trepanation des Warzenfortsatzes. *Ibid.*

[34] *Weber.* Die Tenotomie des musc. tensor tympani. Berlin, Klin. Wochenschr., 1871. No. 48. Ueber die Zwecke die Wirkung und die Ausfuhrung der Tenotomie des musc. tensor tympani. Monatschr. f. Ohrenheilk. VI. 1. Ueber Mittelohrmuskelerkrankungen und deren Therapie. Monatschr. f. Ohrenheilk. V. 11.

Gruber. Tenotomie des musc. tensor tympani. K. K. Gesellschaft der Aerzte Wien., Feb 16th, 1872.

[31] Seltene anomalie u. s. w. Wien. Med. Presse.

[35] *Lucae.* Neue Fälle von Durchschneidung der hinteren Trommelfell falte. Berlin. Klin. Wochenschr. 1872. No. 4.

Roosa. A lecture on affections of the external auditory canal. Med. Record, Feb. 1872. Statistical report of 190 cases of diseases of the ear.

[41] The nasal douche in aural disease. Arch. of Opth. and Otol. III. 1.

Poorten, W. Ein Fall von Otitis ext. diff. acut. mit Durchbruch des Eiters durch die nach oben und hinten offene Knorpelrinne. Monatschr. f. Ohrenheilk. VI. 6.

Pauli. Ueber die extraction fremder Körper im ausseren Gehörgange. Deutsche Klinik, Jan. 1872.

[36] *Löwenberg.* Fremder Körper im ausseren Gehörgang. Berlin Med. Wochenschr. No. 9. 1872.

Blake, C. J. Living larvae in the human ear. Archiv. of Opth. and Otol. II. 2.

Luigi Violani. Le mallatie dell' Orecchio. L'Ippocratico, XXXIV. 19.

Voltolini. Die Anwendung der Galvano-caustik im inneren des Kehlkopfes sowie in der Mund und Nasenhöhle und die Ohren. Wien, 1871.

Poorten W. Ueber den Weber'schen Paukenhöhlen-katheter. Monatschr. f. Ohrenheilk. VI. 1.

De Rossi. Ventil-Einspritzungs-Röhre zur Einführung der Medicamentösen Flüssigkeiten ins mittlere Ohr. Monatschr f. Ohrenheilk. V. 9.

Weber. Zur semiotik der bei der luftdouche sich ergebenden Auscultations geraûsche. Monatschr. f. Ohrenheilk. V. 12.

Spencer N. H. Sclerosis, or plastic inflammation of the middle ear. St. Louis Med. Surg. Journal, July, 1871.

[37] *Weber.* Otitis intermittens. Monatschr. f. Ohrenheilk. V. 11.

Hackley, C. E. An instrument for throwing spray into the middle ear. Med. Record, No. 134.

Pardee, C. J. Chronic purulent aural catarrh. N. Y. Med. Record, 140.

Dalby. Perforation of the membrana tympani. Lancet. II. 8–10.

Harban, G. C. Catarrh of tympanum from nasal douche. Phila. Med. Times, Aug. 21.

Hulings, J. J. Deafness by diphtheritic paralysis. Lancet, I. May.

Prompt, P. J. Affections of the brain resulting from Otitis. Jour. de Bruxelles, LIII. July.

Dalby, W. B. Aural polypi. Lancet, III. Dec.

Taylor and Haynes Stanley. Catheterization of the Eustachian tube. British Med. Jour., Nov. and Dec.

Vawdray, L. C. Twelve years deafness; paracentesis, recovery. Lancet, II. November.

Miot, L. Atresia. Gaz. des Hopitaux, 1871. 95.

Anstie. Otalgia. Ed. Med. Jour., Feb. 1872.

Binz, C. Studien ueber Chinin. Berlin, Klin Wocheuschr. November, 1871.

[38] *Böke, J.* Ueber Ohrenkrankheiten der Kinder. Jahrb. F. Kinderheilk, 1871.

[42] *Prout, J. S.* A new and uniform method of recording the hearing power. Bost. Med. and Surg. Jour., Feb. 1872.

[40] *Wreden.* Mittleohr. Erkrankungen und deren Therapie.

[39] *Voltolini.* Die acute entzundung des Hautigen Labyrinthes. Monatschr. f. Ohrenheilk. V. 9.

Bell, A. Graham. Visible speech as a means of communicating articulation to deaf mutes. Washington, 1872.

[43] *Bonnafort.* Deux observations de Myringite (du tympan) suivies de symptômes simulant une affection grave des méninges; l'une produit par la compressione de la membrane du tympan par un épanchement de matières dans la caisse; l'autre par l'inflammation de cette membrane et des végétations a sa surface externe. L'Union Medicale, No. 44.

Duplay. Revue critique des maladies de l'Oreille interne. Archives Generales de Med., 1872.

ACCIDENTAL EVULSION OF THE MEMBRANA TYMPANI AND THE OSSICLES OF HEARING.

By C. H. Burnet, M. D., Philadelphia.

On the 30th day of April, 1872, Mr. E. S., thirty-nine years old, a machinist, consulted me at the Philadelphia Dispensary, for pain and deafness in the left ear.

He stated that three days previous, while crossing a street, a horse had splashed mud in his ear, which at that time was perfectly sound. Upon returning to the shop where he is employed, his ear was examined by some of his comrades, who said they saw foreign objects in the meatus, and proceeded to extract them with *chips* and *mechanics' small tools*. This caused the patient great suffering, and he says that several little white pebbles were taken out (probably ossicles), followed by great deafness in the ear. The pain increased, and a large, red, and hard tumefaction appeared under the left auricle, extending to the angle of the inferior maxilla.

The patient, a naturally strong man, was very pale, anxious, and bathed in cold sweat. There was no discharge at the time he visited me, of any kind.

My large testing watch, audible forty feet, was heard by this man only five cm.; the voice close to the ear, — most probably by bone induction. The fork placed on the vertex very distinctly heard in the affected ear.

Upon inspection, I found the meatus uninjured. A small piece of black street mud adherent to antero-superior quadrant of the periphery of the membrana tympani. The membrana tympani was entirely destroyed, excepting a very narrow peripheral band. There were no ossicles visible; the hammer-handle entirely gone. The inner wall of the tympanum fully exposed to view, revealing healthy mucous membrane, slightly abraded on the promontory. Air passed

with greatest ease through the perforation by the Valsalvan method.

Twenty days later. Patient came again at my request. He has been hard at work ever since the injury, not excepting Sundays. Has utterly neglected to follow any of the simple injunctions I placed upon him to apply three leeches to the swollen glands and remain quiet. The pain and tumefaction have disappeared. Patient is ruddy and cheerful. No air passes from the meatus by the Valsalvan method. Hearing distance unaltered.

Upon inspection, I found the edges of the old membrane adherent to the promontory, which seemed to project into the meatus in consequence of the excessive retraction of the small remnant of the membrana tympani.

It is interesting to notice the sudden and great loss of hearing caused by this accident. A simple accidental perforation of the membrana rarely, if ever, causes such a degree of deafness.

Of five cases of accidental perforation which I have seen within a year, only this man experienced such a loss of hearing; but he was the only one in whom the ossicles were implicated. Three of these cases of accidental perforation were in Vienna. Two were men, — in Gruber's clinic; one was a female, in Politzer's clinic. The other two were males, and occurred in my own clinic, connected with the Philadelphia dispensary. Three were caused by an ordinary "box on the ear." One caused by a blow on the ear while scratching the meatus with the point of a lead-pencil, the blow driving the point into the tympanum through the membrane.

We are all familiar with many cases in which the membrana tympani is perforated by disease and accompanied by discharge, and still a fair hearing distance maintained, because the ossicles are, at least in their articulations, perfect. In the case already narrated, I attribute the sudden and almost total deafness to the destruction and evulsion of all the usually visible portions of the ossicles of hearing, and the disintegration of the articulations of the chain of bones,

together with the destruction of the membrana tympani.

The following case, the last of the five cases alluded to, will show the results of a simple traumatic perforation of the membrana tympani.

Moses S., thirty-nine years old, tailor, consulted me on June 6, 1872, for hardness of hearing, caused by a blow given in sport on the left ear, eleven days previous to his calling on me at the dispensary. Patient states that instantly after the blow, he noticed a diminution of the power of hearing. The right ear has been very deaf since childhood, and I suspected that the wounded one was not acute in its function at the time of the injury. This the patient indirectly admitted later in his visits to me.

I found that my large watch, audible forty feet, was heard sixty-five cm.; the voice, in conversation or spoken words, five paces. Inspection showed a round perforation, three mm. in diameter, in antero-inferior quadrant of the membrana tympani.

Small amount of dried blood around the edge of the perforation; membrane white and somewhat thickened. The use of Politzer's method of inflating the tympanum, brought the hearing power up to nine paces for watch and voice, and by July 5th, the perforation had closed. The patient says he can hear about as well as ever; thus confirming my suspicion that the ear was not a normal one at the time he received the blow, a very important consideration in medical jurisprudence. The recovery in this case, although in a diseased ear, shows how vastly more serious the injury is when it involves one or more of the articulations of the ossicles.

In concluding, it is hardly necessary to call the attention of this body to the rarity of such cases as the first one alluded to in this paper; viz., fracture and evulsion of the ossicles of the ear.

On page 151 of Roosa's translation of V. Troeltsch on the Ear, it is stated that Meinère has recorded one case of simple fracture of the malleus.

Von Troeltsch saw a united fracture of the malleus. Hyrtl has a specimen of united fracture of the malleus of a prairie dog, in his cabinet in Vienna; and Weir, of New York, relates a case of united fracture of the malleus in an Irish laborer; and Toynbee mentions a pathological specimen of united fraction of malleus in London, but without any history.

CLINICAL CONTRIBUTIONS. By D. B. St. John Roosa, M. D., of New York.

Two Cases of Otitis Media Hemorrhagica.

Within the past year I have seen two cases of acute inflammation of the middle ear, which seem to me a little different from those generally seen, or at least described. For reasons which will plainly appear in the history, I have ventured to classify them under the term *otitis media hemorrhagica*. It is well established that hemorrhage into the middle ear may occur in the course of kidney disease, just as from the vessels of the retina; but the two cases which I am about to describe certainly do not come under the classification of hemorrhage from blood-vessels made atheromatous by renal disease. They are, I think, to be considered as cases of acute inflammation of the lining membrane of the middle ear, in which the morbid process has an unusually rapid and violent course, so that not merely an exudation through the walls of the vessels, but an actual breaking down of the walls themselves, occurs; there is then such an accumulation of the blood in the cavity of the tympanum that rupture of the drum-head almost necessarily follows. We all have observed that in many cases of paracentesis of the membrane, for the relief of inflammation of the lining membrane of the drum cavity, blood is the only product that escapes. I think these cases are analogous to those which I am about to record, and that they serve to explain them.

The first case that directed my attention to hemorrhage through the membrana tympani, as a consequence of acute inflammation of the middle ear, was that of a young lady, of rather delicate organization, who was under the care of Drs. Agnew and Loring. I saw the case in consultation with the latter-named gentleman, who gave me the history.

The patient was deaf from what seemed to be hypertrophy of the membrane lining the drum cavity; the membrana tympani was thickened, sunken, and immovable; she was treated in the usual manner, *i. e.* the catheter, and Politzer's method were employed, and the attempt made by them to force the drum-head outward. On the day or day before I saw the patient, and about twenty-four hours after the catheter and Politzer's method were used, she was seized with violent pain referred to the depth of the ear; to relieve this paregoric was dropped into the ear. Dr. Loring and I saw the patient in the evening; the pain had then somewhat abated. On examination, I found, after carefully removing the fluid that had been dropped in, that the membrana tympani was ruptured, and that blood was issuing from the *pulsating* opening. The patient recovered after an erysipelatous inflammation of the auditory canal and side of the face. I did not see her again, but Dr. Agnew examined the membrane in a few days, and could find no rupture, and no trace of it.

I might, perhaps, be slightly in doubt as to the occurrence of a rupture and hemorrhage from the membrane in this case, had I not seen one subsequently which was very similar, and where, as in this case, *no suppuration* occurred after the rupture, and consequently no scar remained. The presence of the paregoric rendered it somewhat difficult to determine whether the fluid in the rupture was blood or not; but I took this fully into consideration, and determined that it was.

The second case occurred in a gentleman in good health, of forty-seven years of age. He smoked excessively, but in other respects his habits were good. He had chronic pharyngeal catarrh, but it troubled him very little. He did not remember that he had ever had earache as a child or adult. I saw him on November 7, 1871. His history was as follows: About ten o'clock to-day, he suddenly experienced a severe pain in his right ear. The pain was so acute that the patient was obliged to leave his business and go home. The treat-

ment consisted in the instillation of sweet oil and tincture of opium. There was no relief, however, until about six P. M., when "a loud report occurred in his head," and quite a free hemorrhage occurred. The patient thought more than a teaspoonful of blood escaped. I saw him a few moments after the hemorrhage had occurred. The pain had entirely subsided; the membrana tympani was perforated in the anterior and inferior quadrant, and a small quantity of dark-colored blood was about and in the opening, while the membrane was pulsating as in the former case, or rather the blood column was pulsating in the cavity of the tympanum. This patient fully recovered without any suppuration whatever. The opening healed, and the hearing, which was reduced to such an amount as to be expressed by the fraction $\frac{1}{36}$, was restored to a normal standard. The treatment consisted in the careful use of an injection of tepid water, just after the occurrence of the rupture, with the subsequent use of the Eustachian catheter, through which air was introduced, and Politzer's method of inflating the drum-head.

The history of these two cases, as well as of those cases of paracentesis of the membrana tympani where blood only escaped, indicates that *otitis media hemorrhagica* is a much more tractable form of middle-ear inflammation than true catarrhal, or suppurative inflammation. They serve to strengthen the indications for an early perforation of the drum-head when accumulations occur in the tympanic cavity.

A Case illustrating the Effects of Quinine upon the Ear, and the Etiology of inspissated Cerumen.

On the 3d of May, 1870, I was consulted by Dr. N., aet. 34, on account of his throat and ears. He stated that he had had acute pharyngeal and laryngeal disease some ten years before. He also informed me that neither he nor his parents have any recollection of any serious difficulty with his ears prior to the date of the attack, from whose consequences he is now suffering. The laryngeal inflammation was

followed by chronic naso-pharyngeal catarrh, and in 1863 he was obliged to take five-grain doses of quinine for some weeks on account of nervous prostration from malarial fever contracted in the Southern States. These doses were increased to ten grains, and cinchonism was produced. The symptoms of cinchonism were, ringing in the ears and dizziness. In 1864, the doctor again took quinine until the constitutional effects were produced, the dose finally reached being twenty to twenty-five grains, which was taken every other day. While employing the quinine in this manner a severe attack of otitis occurred. The patient states in a written history taken from his diary that he recovered from the otitis under antiphlogistic treatment. After recovery from the aural disease, Dr. N. was obliged to resort to the use of the quinine on account of the constitutional disease, — a severe malarial neuralgia. He took one dose of fifteen grains, which was followed by pain in the ears. Several efforts were made to return to the use of the quinine, but pain in the ear supervened on each dose. "From this period, February, 1865," to quote the exact words of the patient, "my ears began to give me constant trouble. I was incessantly annoyed by unnatural noises, which would frequently reach such a pitch, for a few moments, as to exclude all other sounds." The naso-pharyngeal disease also increased, and in March, 1865, he was seen, on account of the state of his ears, by a distinguished practitioner. The throat was considered the origin of the aural affection, and it was accordingly treated, and was improved; but the ears remained in the same condition, that is, they were sensitive and affected by tinnitus, and there was some impairment of hearing. After the pharynx had been treated, until July of this year (1865), and while undergoing treatment, another attack of otitis media occurred, which was preceded by five weeks of facial neuralgia. The use of quinine for the relief of these attacks had been avoided; but at last, the patient, worn out by pain, took a fifteen-grain dose of the sulphate, upon which the ear disease immediately supervened. The quinine was taken on

July 30th, and the attack of otitis media occurred on the next day. The otitis was of so severe a character as to place the doctor in a very depressed condition, and when he recovered from this and the neuralgia, which he did simultaneously, to use the patient's own language, he was "a perfect wreck." He then sailed for Europe, and in the Scotch Highlands recovered from the malarial disease, never having suffered from it since up to the present time. The ears, however, became very sensitive to the air, and cotton plugs were resorted to, and Doctor N. has never from this time been able to leave the meatus open, even while in-doors, until the past week. The hearing power was also greatly impaired while in Scotland; the patient therefore went to the south of France, where his ears were still troublesome. The aural symptoms were tinnitus, a sense of pressure in the auditory canal, and frequent attacks of neuralgia of the fifth pair. The intellect also became somewhat obscured. After a year's stay abroad, Doctor N. returned home, when the naso-pharyngeal catarrh returned. He then, under the advice of a physician, began the use of the nasal douche for its relief, taking all the precautions that are enjoined, using a warm solution of common salt in water. It was observed, however, that in an hour or two after using the douche, there was an uncomfortable sensation in the ears which became more prominent after each application. The physician then advised "less pressure" in the use of the douche; but the next application was followed by severe pain, and this method of treatment was abandoned. The patient was then suffering from what was called an inflammation of the auditory canal; all treatment was given up until September of this year, when another attack of otitis media and of facial neuralgia occurred. The next two years were spent in Italy.

The general health of the patient was then excellent, but the hearing did not improve, and the patient was obliged to use the cotton plugs. Returning to America in the spring, the naso-pharyngeal catarrh, which had not appeared while in Italy, returned, and in April, pain occurred in both ears,

for which he was treated by leeches, diaphoretics, and hot fomentations; after this attack the patient describes himself as totally deaf, — unable to distinguish the loudest sounds. "There was a feeling of spasmodic constriction, and fulness invading the cavity of the tympanum, and a sensation of pressure upon the drum-head." On the third day the patient became able to hear what was said to him, if the words were spoken very loudly and with the mouth applied close to the ear; as time passed he became still more improved, so that he could hear conversation addressed specially to him at a short distance, and a watch usually heard at four feet, at a distance of two inches on each side, H. $= \frac{2}{48}$. This was his condition when he first came under the writer's observation, on May 3, 1870. I found that the general nervous system of Dr. N., from his years of suffering, was in a highly sensitive condition. His pharynx was highly congested, the uvula very long, and both auditory canals were extremely sensitive and plugged with hard wax. For two weeks the patient was under my care, during which time I cut off the uvula, and made many attempts to remove the impacted wax by syringing, and the use of the forceps; but in all these attempts I failed, in consequence of the hardness of the cerumen and the tightness with which it was held by the auditory canal, and also because the ear was extremely tender to the slightest touch.

At the end of this time, the patient was suddenly called to Minnesota, and I did not see him again until June 26, 1872, when he presented himself and gave the following history of the time that had elapsed. The very small quantity of wax removed, and the cutting off of the uvula, had relieved the pharynx and ears to some slight extent, and, the climate being adapted to his condition, he did very well, except that the hearing was impaired. On June 18, 1871, another attack of otitis occurred, which caused some considerable discomfort, although it was a less severe attack than those which had preceded it. The otitis again occurring, the patient came to me, on the date above mentioned; *more than two years from*

the first visit. I found him suffering severe pain, for which he was taking anodynes; the ears were about in the same state as when I last saw him. The hearing distance was about $\frac{2}{48}$, the canals were plugged with hardened wax; the patient appeared in fair physical condition, but mentally he was excited and slightly irritable and depressed.

I proceeded to remove the impacted wax, and that from the right ear came away on the second day. It was so tightly wedged in that the removal, which was effected by the syringe and forceps, caused severe pain, although the walls of the canal were not touched. On the fifth day, after the use of various agents to soften the mass of cerumen in the left ear, I burned it with nitric acid, and then succeeded in removing it. This removal also caused great pain. The membranæ tympani were suppurating, that is, the outer layers, and they were somewhat sunken, especially along the handle of the malleus. The use of a solution, nitrate of silver 40 gr. ad ℥, and inflation by Politzer's method, soon restored them to a normal appearance, except that the curvature remained altered. The sensitiveness of the ears was removed, so that they could be touched, applications made to the drum-head, and so on, without producing any unpleasant sensations. The hearing distance became $\frac{8}{48}$ on the right side, and was improved on the left, but to what extent I do not know, not having seen the patient for some time. He became able to sleep without an anodyne. The cotton plugs which had been worn for years were now removed, and he became altogether a different person, as regards his mental condition.

Remarks. I think we must regard the otitis in this case, although to a certain extent dependent upon the naso-pharyngeal catarrh, as chiefly caused by the use of quinine. By looking at the history and observing how promptly and invariably the pain in the ears occurred in several instances after the use of the agent, we are forced to the conclusion that quinine was the exciting cause of the aural inflammation. At what date the impaction of wax occurred, we cannot pos-

itively determine. I am disposed to believe that it was at the time the patient awoke profoundly deaf, in April, 1870, or more than two years before it was removed. The wax was certainly there one month after, in May, 1870, when I first saw him. The condition of the patient's mind is illustrated by the fact that he should allow two years to pass away with no attempt to remove a foreign body, from whose partial removal he had obtained some relief, and which he believed to be one of the causes of his impaired hearing. I can only partially account for this delay, by supposing that my efforts at softening and removing the mass had so far succeeded as to lift the cerumen from the drum-head, and thus give partial relief. Indeed, the plug, which I took out on the second day, was on its way out, and would, I think, have soon escaped spontaneously with one of the loud reports with which hardened wax sometimes shoots from the auditory canal. The structure of the plugs was that usually found, that is, *cerumen* in layers; but there was some *epidermis* exfoliated, and also some pus between the mass of wax and the canal.

The case seems to me to be one of those which have been reported, where inflammation of the integument lining the canal was one of the causes of impaction of wax, and that it may be a contribution to the etiology of that disease. The earlier history also illustrates the effect of quinine upon the ear, which I am inclined to suspect is sometimes an inflammation of the conducting portions, as well as of the acoustic nerve or labyrinth. We have long known of the latter effect, but the former has not been often observed.

THE EXAMINATION OF 100 CASES OF IMPACTED CERUMEN, WITH A VIEW OF DETERMINING ITS PATHOLOGICAL INDICATION. By O. D. Pomeroy, M. D., of New York.

At the Manhattan Eye and Ear Hospital it has for several years been customary for some of the medical officers to infer that cases of impaction of cerumen in the external auditory meatus were usually accompanied by some form of aural disease, standing in the relation of cause to effect, and more frequently than otherwise to be chronic aural catarrh.

With a view of determining how frequently disease results, the following observations have been made.

In view of the fact that frequently an absence of a normal amount of cerumen is observed in old cases of aural catarrh, it may, together with the present observations, cause one to infer that the ceruminous function is greatly affected in catarrhal diseases.

Perhaps a theory of *this* kind may sometime be borne out by a sufficient number of facts; that the earlier stages of catarrh result in hyperæmia, and consequently augmented function of the ceruminous glands, which, continued, may result in atrophy, with abolition of function, precisely as results in inflammations of the mucous membrane lining the fauces, etc. The following examinations are claimed to have been made more in detail than were those of the late Mr. Toynbee, as in the present instance both ears of a given case are recorded, besides other details which will be apparent. Tinnitus aurium was not mentioned because it was not thought important in this connection.

It is a well enough known fact that tinnitus in impacted cerumen may result as a consequence of the accompanying catarrh, or from a direct pressure upon the membrane of the drum by the cerumen.

The cases are tabulated as follows: —

Whole number of cases having impacted cerumen in one or both ears	136
Number of cases not specially examined, 36, making 100 cases on which the observations were made.	
Number of cases of normal hearing in both ears .	12
" " " " " one ear . .	3
Number of *ears* where the watch was heard more than 12″, but less than the normal	18
Number of ears where the watch was heard between 6″ and 12″	11
Number of ears where the watch was not heard at all, or not more than 6″	101
Number of cases where the H. D. (hearing distance) is not mentioned	36
Number of cases where the cerumen was found in both ears	58
Number of cases where the cerumen was found in one ear	42
Number of cases of tubal or tympanal catarrh . .	68
Number of cases of disease of the labyrinth . .	3
Number of perforations of the drum membrane .	8
Number of cases of pain in the ear, probably consequent on the cerumen	12

Of the 200 ears where the hearing was tested, it was found to be normal only in 27 instances.

The percentage of perfect recovering in this table is very much below that of Toynbee. The latter, which is also verified by Troltsch, is as follows: 160 ears examined, with 60 perfect restorations of the hearing power, 43 considerably improved, with 62 in which there was none, or very little improvement to the hearing. By contrast it will be seen that the percentage of normal cases is much lower in this table than Toynbee. It may be worthy of remark that those cases marked normal hearing, usually *had* normal hearing; *any* deviation, however small, threw them out of this category.

It is quite possible that Toynbee cases were examined with less strictness. Another fact creeps in to modify the result; in examining a hundred people at random for absolutely normal hearing, a good number undoubtedly will be found defective, without necessarily proving very much. Another source of fallacy, and which causes us to place less confidence in these statistics, is this: in the case before us only diseased ears were examined, and those *diseased* ears having cerumen are noted. I suspect that if every case of impacted cerumen was examined, not waiting until the patient was conscious of trouble, we should find, undoubtedly, a much smaller percentage of disease accompanying it. The hearing was generally improved after the removal of the cerumen in the above cases, and usually still further improved by inflating the tympanic cavity. The explanation of this improvement is not always susceptible of exactness; sometimes the catarrhal condition of the tubes is sufficient to produce collapsed drum membranes; again the cerumen may press on the membranes, requiring inflation to restore their position; or the syringing to remove the cerumen *may* press the membrane inwards as suggested by one of our number. I had not been prepared to see so large a number (8) of perforation cases associated with impacted cerumen; but the facts stated here are probably carefully enough recorded, and of course proves that a purulent inflammation, as well as the catarrhal form, may be accompanied by collections of cerumen in the external meatus. In a large number of cases, redness of the membrane was noticed, in some cases causing it to resemble a piece of raw beef, when no light point, or malleus, could be demonstrated; this condition of things has disappeared in from two to four days, entirely.

I have seen the dermoid layer of the membrane almost completely exfoliated, after the removal of cerumen, with absence of the light spot, and after three or four days have seen it so far restored that the membrane presented nearly its normal polish, with almost a perfect light spot. A few cases are worthy of special mention. Case 2 contained cerumen

insoluble in water; it was syringed three times in a thorough manner without producing any effect upon it; finally, removal was accomplished by forceps.

Case 8 reads, "syringed three times without removal; sweet oil was then used to soften the wax, which was subsequently removed by probes, forceps, etc." Case 85 records "cerumen removed with great difficulty." As we are in the habit, at the Manhattan, of removing cerumen by syringing at the first sitting with simple warm water, these facts have a peculiar significance; some excuse is furnished for those who delight in ear-picks, spoons, etc., for removal of the cerumen.

Case 8 contains this statement: "The patient had not slept for three nights previous to coming to the hospital, from the pain resulting from inflammation of external canal, which (the canal) was found to contain, after the removal of the cerumen, several large granulations."

Case 33 records that "external meatus reddened as though the cerumen had produced irritation."

Case 51 records, "left meatus reddened and excoriated."

Case 70 records, "redness and swelling of the auricle came on five days previous to removal of cerumen, but there was no pain."

Case 16 records, "pain in ear five days previous to removal."

Case 26 records, "within a week has caught cold and has pain in the ear."

Case 29 reads, "impacted cerumen in right ear, and has pain lasting five days previous to removal."

It would seem from the above that the presence of cerumen in the external meatus, in considerable quantities, was sufficient to excite inflammation. It would also seem by some of the cases, that the cerumen invited an attack of acute inflammation of the ear, while the patient was suffering from a catarrh of the throat, as in a common cold. In the cases of normal hearing, I find some of them with cerumen in both ears, and others with cerumen in only one ear, it seeming to follow no

rule. One case had an ear from which the cerumen had not been removed in twenty years!

The cerumen was of a grayish-white color, quite soft, and easily removed. Strange to say, the hearing was nearly restored to the normal. I am not quite sure that the patient's statement here could be relied upon.

In the preparation of the above statistics, I have been greatly indebted to the kind assistance of Dr. David Webster, House Surgeon of the Manhattan Eye and Ear Hospital.

A CASE OF SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR, WITH EXFOLIATION OF THE WHOLE OF THE TEMPORAL BONE EXCEPT THE LOWER PART OF THE EXTERNAL AUDITORY MEATUS, AND THE INNER PORTION OF THE PETROUS BONE; RECOVERY, WITH SLIGHT FACIAL PARALYSIS OF THE SAME SIDE. By O. D. Pomeroy, M. D., of New York.

WITH A PHOTOGRAPH.

John Eddington, aged twenty months, applied to the College Clinique, on July 26, 1871, for a discharge from the right ear, which had continued for the last three months, accompanied by great pain. There was a pale-looking, boggy swelling over the mastoid region, without distinct signs of fluctuation, which I at once freely incised, without evacuating pus. In two or three days, however, a purulent process was inaugurated. The child had previously had head symptoms, which were partially relieved by the operation. A poultice was applied to the wound. On the 28th, there was considerable cellulitis extending above the auricle and to the front. Another incision was made, enlarging the old wound upwards and forwards towards the greatest amount of swelling; the bone was felt to be rough and of unequal depth. Sept. 1st, swelling less, child looks much better generally. Sept. 4th, the bogginess has extended farther upwards, which resulted in the making an incisionstill farther in the same direction. At the upper end of the wound the probe suddenly passed a half inch into the mastoid cells. After the last division of tissue the patient continued to do moderately well for the next three months, although there was very

great swelling of the tissue in front of the auricle, tempting one to incise, but from the proximity of large vessels, it was thought an unsafe procedure.

Water, almost from the first, could be readily passed from the external auditory canal, through the aperture made by the incision. Partial paralysis of the muscles of the face of the same side resulted in about six weeks from the commencement of treatment; about October 1, a small piece of dead bone was first observed behind and a little above the external meatus, at first entirely immovable, but after a week or two found to be movable, but apparently extending deeply into the side of the head. After about a month the bone was grasped by a stout pair of forceps, and some tracti n made, but it produced so much hemorrhage that further effort was desisted from, by the advice of Dr. Agnew. The discharge, as might be inferred, was highly offensive, and solutions of carbolic acid, and the liq. sod. chlo. were freely used.

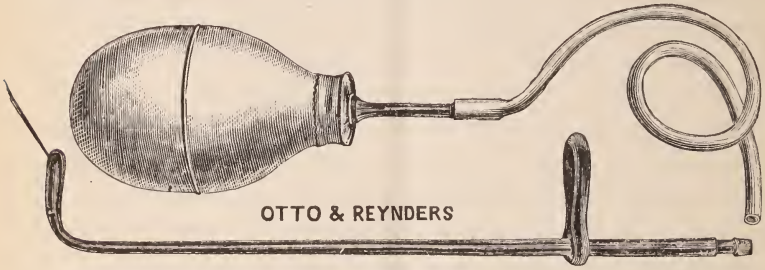
On December 26th, the mother returned to the hospital with the child, bringing the sequestrum which had so long resisted removal. It consisted of almost the whole of the temporal bone, except a small part of the lower portion of the external auditory canal, and a little of the inner portion of the petrous bone; the specimen almost surrounds the external meatus, and contains apertures for the three semicircular canals. The specimen shows the corrosive action of the pus it was so long bathed in. Within two weeks after the removal, the facial paralysis very greatly diminished, and the other symptoms show ameliorations; the mother is directed to gently syringe the ear two or three times a day, sending the water as before from the exterior canal through the mastoid opening; the latter is diminishing in size. About one month subsequent to last date, a swelling extended from the old wound downwards towards the neck, which was at once incised, giving permanent relief; at present, July, 1872, the child is doing well; there is a little facial paralysis; the aperture through which the sequestrum passed is nearly closed; the discharge is very moderate;

general health of the child is good, and it is growing satis factorily.

The question had repeatedly arisen as to the propriety ot forcibly removing the sequestrum; it was thought that if violence was used in dragging away the piece of bone, a meningitis might be set up, or dangerous hemorrhage would result from the tearing or breaking of some of the larger cerebral vessels. It was consequently decided not to meddle with it, allowing it to be separated by natural processes; it is, perhaps, worthy of remark, that little or no vertigo or other head symptoms resulted from syringing the ear, although it was done in a thorough manner. The above is thought by the writer to be the largest sequestrum from the ear lately reported. The case recorded by Dr. Agnew, where the whole of the internal ear was removed by himself, approaches nearer to this in size, perhaps, than any other recently observed. I had naturally enough watched for an unfavorable prognosis; but up to the present date the patient remains in a fair state of health.

A FAUCIAL EUSTACHIAN CATHETER. By O. D. Pomeroy, M. D., of New York.

The object of this instrument is, as its name implies, the catheterization of the Eustachian tube by means of an instrument passing through the throat instead of the nostrils, as is done with the ordinary catheter. The claim set forth with the above instrument is, that its introduction behind the uvula is much more easily and rapidly effected than by the ordinary instrument, and with less violence. When inflation only is needed, the instrument at one insertion may be passed first to the mouth of one tube, and then to the other, by simply turning the beak of the catheter to the opposite side of the throat.



The instrument consists of a hard rubber tube, seven and a half inches in length; breadth at its larger portion one fourth of an inch, tapering to the beak, which is a little more than one eighth of an inch in thickness.

At the larger extremity is a tip for the adjustment of a rubber tube; beyond this, at a distance of about an inch and a half, is a perpendicular *guide* passing in an opposite direction to the bent extremity of the tube (in the wood-cut it is wrongly placed), showing the direction of the beak of the instrument when in position. The bent portion of the tube is one inch and three sixteenths in length (for children

it may be about three fourths of an inch); and forms an angle of 70° to 75° with the straight portion of the tube. Within a line or a line and a half of the extremity of the tube is the aperture for the injection of air or fluids, and which is the size of a No. 1 Bowman probe, and is placed at an angle of 50° with the bent portion of the tube; that is, not quite in the end, but a little beyond it, so as to throw the stream of air or fluid *from* the operator rather than *towards* him.

By inspection, the aperture will be found to be nearly in the axis of the Eustachian tube, when the instrument is in position. The catheter is used in the following manner, to wit: It is attached to a Politzer bag, with the usual perforation (for filling with air), by means of a rubber tube; the instrument is then caught in the left hand by its extremity (not by the guide) and turned on the flat, passed along on the dorsum of the tongue until opposite the aperture behind the uvula, when it is suddenly turned upwards and passed to the region of the tube. If the tonsils are enlarged, presenting a too narrow cleft for this semicircular turn, it must be passed in with the beak turned upwards and the tongue depressed, either by the instrument, or a tongue spatula. When it is well behind the uvula, it may for the right side be turned so that the guide stands about at an angle of 50° with the horizon, when the aperture in the beak of the instrument will be opposite the fossa of the Eustachian tube. The opposite turn for the left side brings the instrument in position for the left tube.

In all cases, it will be well to slightly draw the instrument towards the operator after its passage behind the uvula, especially if the latter contracts upon it and against the back wall of the pharynx, which so frequently results.

If the uvula persists in this position, I would advise withdrawing the instrument before attempting the opposite tube, as under these circumstances much violence might result (*i. e.* in the excursion of the beak of the instrument from one tube to the other). The proper test as to whether

the tube has been placed in position, is, first, the facility with which the cavity may be inflated; and second, in applying a very small portion of a strong caustic solution, it may, by the rhinoscope, be seen whitened exactly where the aperture of the tube was placed during the injection of the solution. The writer, with a twentieth of a drop of a saturated solution of nitrate of silver, has frequently cauterized a minute disk of mucous membrane within the fossa of the tube. The inconstant position of the faucial extremity of the Eustachian tube has not by the writer been observed, as described by some, the position being, according to his experience, sufficiently uniform to give little or no annoyance; but even if it is a little irregular in location, the rhinoscope detects it easily enough. Any introduction of a faucial catheter under sight by means of the rhinoscope, is regarded by the writer as so nearly impossible as to be wholly impracticable.

The injection of the tympanic cavity with air by means of this instrument is readily done by compressing the rubber bag, when the instrument is in position, and may, if the throat is irritable, be done in a second. If a powerful effect is desired, the aperture in the catheter may be made larger, when all the inflation desired may be accomplished. This operation is more readily done ordinarily than Politzer's.

For the injection of fluids the following manœuvre is indicated, and we will assume that nitrate of silver is used: with an atropine dropper, or any convenient instrument, a fractional part of one drop, or 2, 3, or 6 drops, is deposited on an artist's pallet, a card, or even a piece of white writing-paper; the beak of the catheter at its perforation is immersed in the drop with the rubber bag compressed (the thumb or finger on the perforation in the bag), then it is allowed to fill with air, from the beak of the catheter (and not from the aperture covered by the thumb), by which means the drop is drawn into the tube through this minute aperture.

When applied to the Eustachian tube, a second pressure on the rubber bag injects it into the fossa of the tube, and

sometimes a little way into the tube itself, in the form of a coarse spray. If a really fine spray is needed, a very minute aperture may be made; but this will not sufficiently inflate the cavity with air, and will give some trouble to keep it from being clogged. I had not before stated it, but it is intended to inflate the cavity as well as apply the remedy at the same time.

In ordinary catarrh of the tube, I prefer not to throw the solution far into it, and not at all into the cavity, which is so liable to result from ordinary catheterization. This instrument is not new so far as injection of the cavity with air is concerned; but with its general scope the author thinks it may come under the head of "a useful modification of an instrument." As this was used some time before I had heard of Cutter's catheter, and as its construction is essentially different, I have thought best not to make any special allusion to that. In the cut, the spray emerging from the end of the tube is somewhat imperfectly represented.

SUMMARY OF RESULTS OF EXPERIMENTS ON THE PERCEPTION OF HIGH MUSICAL TONES.

By Clarence J. Blake, M. D., Boston.

The highest limit of the perceptive power of the human ear is very variously estimated by various authors. Vierordt, for instance, gives the value of the highest tone as 48,000 (single) vibrations in the second. Helmholz puts it at 76,000 single vibrations in the second, and Despretz, at 73,700 single vibrations in the second. This discrepancy in the results obtained by different observers leads us naturally to the question as to the cause thereof; and since the test employed is always the same, a fixed number of vibrations in a second always giving the same tone, we must turn to the possibility of variation in the organ tested for an explanation of the difference. That there should be various degrees of extent of the perceptive power of the human ear in different individuals is to be expected; but this is not in itself sufficient to account for the difference in the degree of perception of high tones, particularly in different individuals, or even in the same individual under varying conditions.

That the difference is largely due to variations in the sound-conducting and not in the perceptive portion of the auditory apparatus, may be readily demonstrated by experiment, and the discrepancy of statement as to the degree of perception possibly accounted for. In conducting such experiments, it is necessary first to have instruments with which high tones of a determined quality may be repeated at will with the same degree of intensity; and second, to be able to determine accurately the condition of the organ tested. For the accomplishment of the latter object, we have the instruments at the command of every aural surgeon.

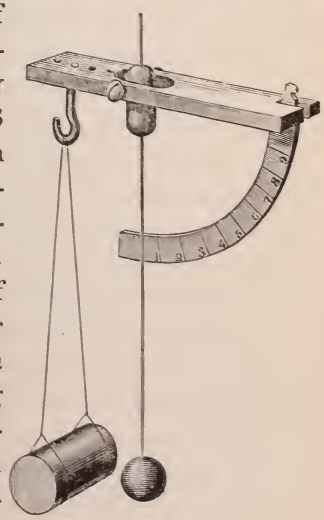
For the production of high musical tones, the steel rods as made by König, of Paris, are the best for the purpose of

accurate tests. The musical value of a steel rod of certain temper and length, and of a fixed diameter, say 2 c. m., having been ascertained, the proper length of rods of the same temper and diameter to give higher tones may be determined by the rule that the number of vibrations is inversely proportional to the square of the length of the rod.

The dimensions of such a series of rods, 2 c. m. in diameter, of Hobson's choice steel, white temper, would be as follows:

Length.	Point of Suspension.	Value.
70.5 m. m.	16.4 m. m.	35,000 v. s.
66.2 " "	15.4 " "	40,000 " "
62.4 " "	14.5 " "	45,000 " "
59.1 " "	13.7 " "	50,000 " "
56.2 " "	13.1 " "	55,000 " "
53.8 " "	12.5 " "	60,000 " "
51.8 " "	12.05 " "	65,000 " "
50.1 " "	11.6 " "	70,000 " "
48.7 " "	11.3 " "	75,000 " "
47.5 " "	11.04 " "	80,000 " "

In order to get a clear tone it is necessary to suspend the rods by means of loops of silk, or of fine wire; a loss of clearness in tone is the result of variation from a given point of suspension, which may be obtained by dividing the length of the rod by 4.3 the result giving the distance from the end of the rod, for the attachment of the silk or wire; for example, the length 70.5÷4.3=16.4, etc. To obtain a determined intensity of tone is the next requisite, and for this purpose I have employed a small steel pendulum, swinging through an arc of 90°, and suspended from a frame-work, from which the rods may also be sus-



pended. By means of the pendulum swinging a given distance and striking the rod, a definite degree of intensity is obtained, which may be controlled at pleasure. With this instrument and the steel rods, the first series of experiments was to ascertain the average perceptive power in the normal ear; and this was found to vary considerably with the age; thus, at about the ages of twelve and thirteen years a tone of 40,960 v. s. was heard at a distance of 34 feet; at the ages of from eighteen to twenty years, the same tone was heard only at distances of from 13 to 16 feet, and at the extreme limit of 34 feet, the tone of 36,864 v. s. only; at the ages of from twenty-eight to thirty years, at the extreme limit of 34 feet, only tones up to 32,768 v. s. were perceptible; while above the age of fifty years the limit of perception at the same distance had still further diminished, and in a greater variety of degree.

In the majority of the cases of persons over fifty years of age, and possessing, apparently, normal hearing, who were subjected to these tests, an examination of the membrana tympani showed a varying degree of opacity of the membrane, corresponding to a thickening of the mucous coat. To determine the possible connection between this appearance and the diminished perception of high tones, younger persons, in whom the membrana tympani presented an analogous appearance, were tested in the same manner, the result being a corresponding diminution of the perception of the higher tones; with this exception, however, that where the membrana tympani, in addition to thickening of its mucous coat, had its tension increased either by retraction of the musc. tensor tympani, or as the result of exhaustion of the air in the middle ear, the degree of perception of the higher tones was increased rather than diminished, a fact in accordance with the known law concerning the transmission of higher musical tones by tense membranes. In the majority of cases of simple catarrhal affections of the middle ear, in which the membrana tympani was more or less opaque, and the hearing distance for the watch and voice increased on the use of the

air douche, the perception of the higher musical tones above 30,000 v. s. was diminished.

In two cases of voluntary contraction of the musc. tensor tympani the perception increased from 3,000 v. s. to 5,000 v. s. during the contraction of the muscle, above the limit of perception observed when the muscle was not contracted.

A second series of experiments to determine the influence of the membrana tympani upon the perception of high tones, and particularly the result of its elimination, was made in cases of perforation of the membrane in consequence of disease; those cases being selected in which the mucous membrane had returned to its normal condition, as it was found after a few tests that the thickening of the mucous membrane, or the presence of even a slight quantity of secretion in the middle ear, sensibly diminished the perception of the higher tones. The results obtained were of exceeding interest; for while as a rule the perception of higher tones was increased, this varied greatly with the size and location of the perforation, and the corresponding degree of retraction of the musc. tensor tympani. The perception of high tones increased, as a rule, with the approximation of the perforation to the posterior superior periphery of the membrana tympani, and in one case, where a small band of cicatricial tissue extended from the posterior border of the perforation to the long process of the incus, a tone of 65,536 v. s. was distinctly heard.

Aside from the location of the perforations, an increase in size did not seem to be accompanied by an increase in perception of high tones. In all of the above cases, however, there had been, as the result of disease, more or less of change in the structures within the middle ear; and aside from the existence of a perforation of the membrana tympani, more or less of variation from the normal condition.

It became necessary, therefore, in order to obtain a series of controlling experiments by which to judge of the value of those already made, to watch for cases of imperforate membrana tympani in which the perception of the higher tones was normal, or nearly so, and in which it was justifia-

ble to perforate the membrane. Of the cases in which the operation was performed, one especially illustrates in a remarkable degree the result obtained in the majority; namely, an increase in the perception of high tones almost immediately after the operation. In the cases of simple myringotomy, preference was given to the posterior segment of the membrana tympani in making the incision. The case referred to was that of a woman thirty years of age, in whom the hearing in both ears had been gradually and steadily diminishing for at least eight years. At the time of operation, a watch (72 in. normal hearing distance) was heard only on contact in the right ear, and not at all in the left ear; the perception for both watch and tuning-fork through the bones of the head was good. The meatus on both sides was normal, and the membrana tympani of the left ear slightly opaque, concave but in a slight degree, the short process of the malleus not very prominent, and the posterior fold somewhat elongated. Commencing in the posterior segment of the membrane, on a line with the lower end of the process of the malleus, and extending downwards and forwards, was a chain of small calcareous deposits. The test with the steel rods frequently repeated gave a tone of 35,000 v. s. as the limit of perception of high tones in that ear. In this case, the introduction of Politzer's eyelet was decided upon, and with a lance-headed myringotome, two incisions were made in the posterior inferior segment of the membrana tympani, forming a triangular flap with its base directed downwards. The flap was then turned inwards, and a hard rubber eyelet introduced in such a manner that the flap springing upwards should press the eyelet against the edges of the opening and hold it in position, thus obviating the necessity of dilatation by means of the laminaria tent, and disturbing the membrana tympani as little as possible. Immediately after the operation, the hearing for the watch increased to contact, and for the voice to twenty feet distance; while a steel rod, having a tone of 80,000 v. s., was distinctly heard at a distance of three inches from the ear.

This high degree of perception continued unabated, and accompanied by a steady increase of hearing for the voice up to within three weeks of the date of the present meeting of the Otological Society (July 17th). From that time, the hearing for the voice and the perception of high tones diminished until July 14th, when the eyelet came away leaving a small cicatrix. On examination of the eyelet, it was found that a new growth, springing from the edges of the flap, had extended over the inner end of the eyelet, completely occluding the opening, sufficient, when considered in the light of previous observations, to account for the diminished perception of the tones of the steel rods.*

Both as regards the statements of the various authorities as to the extreme limit of the perceptive power of the human ear, and in connection with the observations of Wolf, and the later experiments of Mach and Kessel, the above experiments are of interest, and capable of a much greater degree of elaboration; while they demonstrate, to a certain extent, the diagnostic value of instruments for the purpose of testing the perception of the higher musical tones.

It is due to Professor C. E. Pickering to express my sense of indebtedness for his council as to the mode of conducting the experiments referred to in this paper.

* One week after the meeting of the society, the eyelet was reintroduced with like results as to the perception of high tones, and has remained in position with a continuance of the same up to the present date, Oct. 1st.

CARIES OF THE MEATUS FOLLOWING PURULENT INFLAMMATION OF THE MIDDLE EAR. RECOVERY. By Clarence J. Blake, M. D., Boston.

Jason W., aged 44, entered the Massachusetts Charitable Eye and Ear Infirmary, June 3, 1871, with the following history. Eight weeks previously, after exposure to rain and cold, pain commenced in the right side of the face, gradually extending backwards, until it reached the right ear and region of the mastoid, where it seemed to locate itself and to increase; on the seventh day, simultaneously with the appearance of a discharge from the right ear, the pain diminished, but returned with increased severity, extending upwards and backwards, and continued with but slight abatement up to the date of his admission to the Infirmary, at which time the pain had become more distinctly localized, and was confined principally to the region of the mastoid and to the middle ear. The mastoid region was swollen, red and tender, the side of the face somewhat swollen, and the ear discharging a thick, yellowish, and offensive pus, at the rate of about a fluid ounce daily. On cleansing the ear, the meatus was found to be filled with firm polypi, springing principally from the posterior inferior wall, and so crowded together as to leave but a small passage through which the pus slowly forced its way. In addition to the local symptoms, there was much fever, a quick pulse, a furred tongue, and constipation; the ear was ordered to be syringed repeatedly with a solution of acetate of lead one drachm to the pint of warm water, and leeches were applied behind the ear, with some relief from the pain and sense of fulness. The patient was put upon a generous diet, with eggnog thrice daily; iron, strychnia, and podophyllin and thirty grains of chloral hydrate at night; to be repeated if necessary.

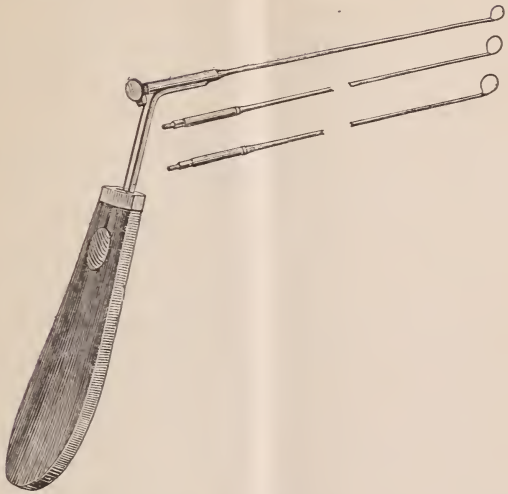
Three days later, the swelling over the mastoid having increased, and it being evident, also, that pus was burrowing downwards, a free incision an inch and a half in length was made from above downwards, commencing at about half an inch behind the auricle, on a line with the superior border of the concha, and extending downwards to the apex of the mastoid process; a probe was then passed into the cavity to the depth of half an inch or more, and freely moved, its withdrawal being followed by a very slight discharge of pus; the hemorrhage, which was considerable, from a branch of the posterior auricular artery, was checked by pressure; the sinus in the neck was also opened, with some discharge of offensive pus. Following the incisions the pain sensibly diminished, and on the next day the general symptoms were much more favorable. The granulations in the meatus were removed by means of the snare, and then touched with caustic potassa, the result being a greater freedom of the discharge of pus from the meatus, and an opportunity to get at the granulations filling the middle ear. The latter were readily removed by means of the snare, and on the fifth day after the incision over the mastoid, water syringed in at the meatus passed freely out at the nose and mouth, and spirted in a stream from the mastoid opening.

At this time a probe passed in at the meatus, and directed downwards and backwards, detected a tract of denuded bone extending inwards to the depth of half an inch, and forming a sequestrum firmly attached at its inner end towards the middle ear, but free and projecting among the remains of the granulations near the outer end.

The situation of the sequestrum, and its size, rendered forcible extraction inadvisable. Small cotton tents, therefore, were placed under the free edges of the bone, the opening over the mastoid maintained, and the previous local treatment continued, the result being that on the 15th of July, a piece of bone one inch in length, and half an inch in width, forming a portion of the mastoid wall of the osseous meatus, was readily removed; the day following, a portion of the

mastoid cells, of about one quarter the size of the first piece, came away with the discharge. Within forty-eight hours of the removal of the sequestra, the opening over the mastoid had closed, and two weeks later the patient was discharged, without other evidence of his trouble than the scar over the mastoid, destruction of the membrana tympani, and absence of the malleus and incus, and a diminution of hearing to the distance of six feet for the voice.

A MIDDLE EAR MIRROR. By Clarence J. Blake, M. D., Boston.



Among the cases of purulent inflammation of the middle ear, accompanied by the formation of polypi, there are a few in which a more accurate examination of the middle ear than we are able to make with the aural speculum alone, is desirable. To this class belong those cases where small granulations springing from the anterior inferior portion of the tympanum, serve to prolong an otorrhœa which would otherwise be more readily amenable to treatment, and the cases of comparative rarity where granulations spring from the superior wall of the tympanum and from the outer wall involving the ossicula. It is in such cases as these that, while we suspect the origin of the trouble, the examination with the aural speculum does not altogether confirm our suspicion, because it affords no view of the more remote portions of the tympanum beyond the limits of the circumference of the membrana tympani. When there is as an accompaniment of the inflammation of the middle ear, either destruction of the membrana tympani, or even a large perforation, it is possible to introduce a reflecting surface which shall give, with

proper illumination, a view of those portions of the tympanum beyond the boundary of the perforation. The possibility of such an examination, however, is of necessity limited to a very small number of cases, as both a moderately wide meatus and a comparatively large opening in the membrana tympani must exist to permit of the introduction of a mirror of sufficient size.

Even though limited in its application, a means of more accurately determining the condition of the more remote portions of the tympanum is of advantage, and not upon therapeutic grounds only. There are still other cases of more frequent occurrence, in which a growth, springing from the inner end of the external auditory meatus, without the membrana tympani, is hidden from direct view by the natural conformation of the walls of the passage, and where an accurate determination of the origin of the growth is important as a preliminary to treatment. It was for the accomplishment of this purpose that the instrument herewith represented was devised, and its subsequent use has convinced me of the value of this means of examination, though, as before stated, in a very limited field. The instrument consists simply of a Weber's tenotome, the cutting hook being replaced by a polished steel mirror of from one sixteenth of an inch to one eighth of an inch in diameter; in some cases it is possible to use a larger mirror. The mirror is made by flattening out the end of the shaft, bending it at the proper angle, tempering and polishing it. The shaft is ductile, so that the angle of the mirror can be varied at will. Shafts of various lengths with mirrors of different sizes may be used in the same handle; and the mirror may be rotated by movement of the stud in the handle, as in the use of the tenotome. Before introducing it, the mirror should be slightly warmed, and after using should be dried with soft, bibulous paper; it is also necessary to have the mirror frequently repolished. A very strong illumination, moreover, is required in order to get a clear reflection from the gray surface of the steel. The mirror may be silvered, but is more liable to become scratched and tarnished.

ON CORPULENCE AS A CAUSE OF DEAFNESS.

Dr. Morland read a few extracts from a volume lately published by Mr. William Harvey, of London, the well-known aurist. The work is entitled "On Corpulence in Relation to Disease."* Mr. Harvey puts forward the opinion that certain cases of deafness are directly traceable to corpulence. After referring to the writings of old authors, in which mention is made of the sinister action of corpulence on many of the internal organs, Mr. Harvey remarks: "None have made any pointed allusion to its distressing effects on the senses of *Hearing*, *Sight*, *Taste*, *and Smell*." "My attention," he adds, "has long been drawn to it as a frequent cause of growing deafness towards the meridian of life." Again he says: "There are other cases of deafness complicated with an excessive development of fat, which will not yield to ordinary treatment, unless a scale of diet be adopted in which saccharine and starchy materials are in some degree avoided, whether these be found in food or liquid." He then goes on to specify the proper diet for such cases, — which, in general terms, may be stated as one composed of "a larger amount of animal food, but not to the exclusion of those fruits and vegetables which contain but little of sugar or starch." Further on in his essay, he gives more explicit dietary directions, and insists upon their great efficacy as a special treatment for this class of cases of deafness. "These cases are sufficiently numerous, replete with interest, and of great practical importance to the aural practitioner." (*op. cit. p.* 2.)

Dr. Morland remarked that he thought the subject worthy the attention of the society, and with that view he had

* On Corpulence in Relation to Disease; with some Remarks on Diet. By William Harvey, Fellow of the Royal College of Surgeons, etc., etc. Renshaw, London, 1872.

brought the work to their notice. The opinion was entirely new to him, and he was not aware that it had ever previously been expressed. He had never noticed that corpulence and deafness were especially, or frequently, associated. Perhaps future observation by aural practitioners may give us something statistical upon the point in question.

None of the members of the society who were present had any experience to report in this direction. Most of them expressed entire incredulity. Since the Annual Meeting, however, Dr. Clarence J. Blake has kindly sent a patient to Dr. Morland for inspection, in whom he considered corpulence might be esteemed a causative element of existing deafness. The patient was a female. Mr. Harvey thinks the female sex more obnoxious to this sort of deafness, from their sedentary habits. At Dr. Morland's request, Dr. Blake has critically examined Mr. Harvey's printed statements, and has sent the following comments upon them. In regard to Harvey's views respecting the influence of enlarged tonsils in causing deafness, it would seem that they can hardly be accepted, in full, with the facts we possess and continually witness, so much in opposition to such a theory, and so clearly proved. Dr. Blake has also carefully considered this point in his remarks.

HARVEY ON CORPULENCE. By C. J. Blake, M. D.

"The stress laid by the author on the effect of corpulence in causing deafness, is based upon the relations of the Eustachian tube to the middle ear, physiologically considered, and upon the anatomical relations of the Eustachian tube to the walls of the pharynx, and to the tonsils. In the latter relationship the author finds no ground for the importance generally given to the condition of the tonsils in causing deafness, and asserts that their anatomical relations to the Eustachian tubes are such as to render an occlusion of the

latter passage by any hypertrophy of these glands impossible. As an explanation of the occlusion of the Eustachian tubes which occurs coincidently with enlargement of the tonsils, the author falls back upon the usually accompanying condition of the mucous membrane.

"In this view there is certainly much reason, more or less of hypertrophy of the tonsils generally accompanying or being accompanied by a condition of the mucous membrane of the pharynx and of the Eustachian tubes which would be sufficient in itself to account for any impairment of the functions of the middle ear; and yet, in some cases, more frequently those of children, we find a very considerable hypertrophy of the tonsils with coincident deafness, or other symptoms of secondary affections of the middle ear, and without apparent affection of the mucous membrane of the pharynx, or at least not enough to account for the symptoms called forth in the ear; and in such cases, moreover, a removal of the enlarged glands is not uncommonly the only treatment required to restore the ear to its normal condition.

"In regard to the effect of corpulence on the hearing, the author takes occasion to draw the attention which the subject deserves, to the influence of obstructions of the nasal passages upon the condition and office of the Eustachian tubes, a point in support of which the observations of Weber may be quoted, and of importance when we consider the nasal passages and continuations, physiologically at least, of the Eustachian tubes. That adipose deposit, by diminishing the patency of the nasal passages as well as by pressing upon the membranous walls of the Eustachian tubes, should cause a loss of equilibrium of the atmospheric pressure within and without the membrana tympani, and consequently the symptoms which the author describes, can be readily understood, and that a general treatment directed to the removal of the corpulence should be the remedy for the aural symptoms, follows as a matter of course."

CASES OF INJURY TO THE EAR FROM EXTERNAL VIOLENCE. By J. Orne Green, M. D., Boston.

The partial or total loss of hearing from accidental injury to the brain, or to the nervous structures of the ear, has long been recognized, and cases are probably familiar to every surgeon; but improved methods of inspection, and a better knowledge of the pathology of the ear, have taught us that there are also many less severe injuries to the more external parts, of which the following cases of accidental injury to the conducting apparatus of the ear are examples.

Although these cases contain, perhaps, nothing more than would be theoretically expected from the nature of the injuries received, the paucity of such observations, and their importance in legal medicine, are my excuse for presenting them to the society. They offer examples of different injuries from the same cause, and also of difference in the severity of the same injury from the same cause.

(1.) B., photographer, aged about 45, was seen February 15, 1870, and gave the following history. Otherwise healthy, he had for a long time noticed, with a cold, slight deafness and mucous râles in the ears. About twelve days before, he was engaged in giving an exhibition of the magic lantern, using an oxyhydrogen light, when one of the gas-bags exploded. At the time, he was standing a few feet from the bag and with the left side towards it. The immediate effect of the explosion was some slight confusion of intellect, which soon passed off; but the next day the left ear began to be painful, and on blowing the nose, air whistled out through it. The pain gradually increased, and a discharge began, at first thin, then thick and purulent.

Examination showed the left meatus filled with thick, puru-

lent matter; the walls of the meatus a little red; the hammer invisible, the membrana tympani red and swollen, and on the posterior segment just behind the umbo, a rupture $1\frac{1}{2}'''$ long, nearly perpendicular, through which purulent matter could be forced by Valsalva's inflation, followed by a distinct perforation whistle.

The right ear showed the membrana tympani thickened in its mucous layer and slightly drawn in.

W. r. $\frac{30}{48}$: l. $\frac{6}{48}$. T. f. on forehead entirely in l.

The course of the disease requires no special mention; it was treated as a simple otitis media purulenta, with leeches, douching, and astringents, and on March 19th the perforation had healed, the swelling of the membrane was going down rapidly, and the hearing was improving. W. l. $\frac{10}{48}$.

When examined some weeks afterwards, the left membrana tympani was more opaque, but otherwise did not differ in appearance from that on the right side; no signs of the rupture could be distinguished. The hearing of the left side was still less than that of the right, and auscultation revealed some catarrhal inflammation remaining. W. r. $\frac{30}{48}$: l. $\frac{18}{48}$.

Two and a half years afterwards, the patient informed me that the ears remained in about the same condition. With a cold there was fulness of both ears, most marked in the injured one, and the same difference in hearing remained.

(2.) X., assistant of B., exposed to the same concussion and injured in the same way: under the care of Dr. Shaw, to whom I am indebted for the account of the case. The explosion produced a rupture of the membrana tympani, followed by a purulent inflammation of the tympanum, which ran a short and favorable course, the rupture healing perfectly and the hearing being restored.

(3.) R., merchant, aged 50, was not aware of any previous disease of the ears, although for years the hearing had not been acute; had never noticed any subjective noises or pain in the ears. For some months had not been quite well, having suffered a good deal from dyspepsia. He was exposed to the same accident as the preceding cases, being one of the

audience in the church in which the exhibition was given, and being seated on the floor about twenty feet in front of the gallery in which the explosion occurred. Just before the accident he had turned round so that the right side was towards the gallery, and as the explosion occurred he felt as if something had struck him on the right side of the head, and immediately after noticed a loud buzzing in the right ear and confusion in the head. These two symptoms had continued constantly up to the time I saw him on February 24th, three weeks after the injury.

On examination I found the right membrana tympani slightly thickened in its mucous layer, but in its natural position; left membrana tympani quite transparent and normal in appearance. Neither membrane, however, had its full power of movement on Valsalva's inflation, and catheterization showed both Eustachian tubes contracted, but not closed.

W. r. $\frac{10}{48}$: l. $\frac{8}{48}$. Tuning-fork on forehead little loudest in r. Catheterization was followed by no improvement of the hearing, but the noises in the left ear were immediately much diminished in intensity, and both the ear and head felt clearer.

He was ordered an inhalation of tincture of iodine to be forced into the ears by Valsalva's inflation every night, and the air-douche by the catheter was used every third day. After each catheterization the noises diminished, and at the end of three weeks had ceased, and both the ear and head felt perfectly natural. There was no material change in the hearing. Unfortunately, the test of the tuning-fork was not tried at the end of the treatment.

(4.) B., sheriff, aged 65, had noticed for some two or three years a slight singing in both ears and some deafness, which he had mentioned incidentally to me some months before I saw him professionally, but which had caused him no inconvenience. He applied to me April 19th, with nearly the same history as the preceding case; he was exposed to the same explosion in just the same position as the preceding patient, and immediately noticed an increased singing in the

ear which had been turned in the direction of the noise. This had continued up to the time I saw him without change.

Examination showed both membranæ tympani thickened, slightly drawn inwards and dull; without movement by Valsalva's inflation. Eustachian tubes contracted, but free from mucus. Catheterization produced no effect on the noises, although the operation was imperfect, from the nervousness of the patient. Hearing considerably affected, but equal in the two ears. W. $\frac{4}{48}$.

On account of the long duration of the subjective noises, I felt obliged to give a doubtful prognosis, which apparently discouraged the patient, as I did not see him again.

(5.) Miss J., teacher, aged 24, seen Sept. 19, 1871; as a child, was deaf for some time after scarlet fever, but recovered perfectly, as she thought, although since has had occasionally a slight ringing in the ears; is subject to cold in the head, and at such times has a feeling of great fulness in the ears. On the 14th instant, while mixing chlorate of potass and other substances in a mortar, she produced a very loud explosion, from which she became immediately so deaf that she could not understand a word spoken close to her, although the voice could be heard. The ears and head felt full as from a cold; there were loud noises and rattling in the ears, but neither pain, bleeding, nor discharge. In half an hour the hearing returned in the left ear, and improved gradually through the day in the right; and the next morning was as good as ever in each, although some singing remained in both ears.

Three days after she was wakened from sleep by a loud "crack" in the right ear, and immediately a very loud singing began in the ear, and continued constantly. Music and certain voices now began to be exceedingly disagreeable to her, sounding exceedingly shrill, and actually causing pain in the ear.

When I saw her she was complaining of a sharp singing, and also a low roaring in the right ear, together with the change in musical notes. In the left ear there was a constant low buzzing; no headache or vertigo.

Examination showed the right membrana tympani very opaque in its centre from thickening, much drawn in, with the small process sharply projecting, reflex only seen at umbo; on the anterior segment a small calcareous deposit. The left membrana tympani was in nearly the same condition, but without the calcareous spot. By Valsalva's inflation no movement or sensation in either ear; throat relaxed, otherwise normal.

W. and V. normal in both ears. Tuning-fork on forehead and teeth heard equally.

The patient was unwilling to follow any active treatment, but reported a week afterwards that she had had frequent sharp pain in the ears. The shrillness of the noise in the right ear had disappeared, and the buzzing in the left was less loud, but there was a disagreeable fulness in the ears.

Oct. 5th. There was less fulness, and the noises were less loud. She could just begin to feel a little movement in the ears by Valsalva's inflation.

Nov. 7th. Had been ill for some days, and the noises were very loud, but soon diminished again so that then she did not mind them. The hearing for musical notes was much improved, but certain notes were still very disagreeable. Hearing perfect; appearances as before, except that there was a slight movement on Valsalva's inflation.

(6.) H., chemist, aged 35, applied to me Oct. 22, 1871. He had been subject to nasal catarrh from boyhood; as a child had otorrhœa in both ears, which had ceased, however, years ago, but ever since then has been quite deaf. Seven days before, while in his laboratory, an explosion of fulminate of mercury took place from the carelessness of a student. The explosion was heavy enough to blow out the windows of the large room, and Mr. H., who was standing some feet distant, immediately had a feeling that both the ears were completely stopped up; became extremely, or, as he says, totally deaf, and on attempting to move had severe vertigo; violent noises as of the escape of steam were also immediately felt in the head, and there was great confusion of the intellect. The vertigo soon passed off, but the other

symptoms continued till night, when the left ear began to feel clearer and the hearing on that side improved.

The next day the noises were quite loud, and were located in both ears; the feeling of closure in the right remained as before, that in the left had entirely gone; the hearing in the left had become about as before the accident, that in the right had improved a very little. Since then the left ear has improved; the noises in it have gone; it feels clear, and the hearing, although very imperfect, is as good as before the explosion. The right ear, however, remains as on the second day, "closed up," with violent noises in it, which have rather increased in intensity.

Examination showed both drum membranes enormously thickened in all their layers from previous inflammation, and in each, directly below the umbo, was a thin cicatrix closing an old perforation; the membrana tympani on the left side was in good position, and the cicatrix was free from the bone; the membrane on the right, however, was much drawn in, and the cicatrix was lying against the promontory, a condition which was proved by touching it with a probe. W. r. on contact: l. ½."

The air-douche by the catheter was used on the right and the cicatrix was heard to separate from the bone with a crack, and examination showed that the membrane and cicatrix had come out into proper position. Immediately the noises almost ceased, the feeling of closure was entirely relieved, and the hearing became equal in the two ears.

Some weeks after I was informed that there was no relapse, the ears being as good as before the accident.

(7.) P., merchant, aged 24, without previous trouble in the ears, except, as he says, slight deafness on taking cold; received a box on the left ear in play six days before I saw him on April 15th, 1872. At the time he was not conscious of any injury having been received; but soon after, on blowing the nose, air whistled out through the ear, and this has continued; with the exception of a very slight deafness on that side, he has had no symptoms, — neither pain, noises, dizziness, headache, nor discharge.

Examination showed a perpendicular rupture on the posterior segment of the membrana tympani, about midway between the end of the manubrium and the posterior wall, and extending nearly the whole width of the membrane. The edges of the wound showed a fine, hair-like red line and had somewhat retracted, making a long oval perforation through which the mucous membrane of the promontory could be seen of a very delicate pink color. The membrana tympani was of a perfectly normal color, except for half a line on each side of the perforation, where it was dull, opaque, and of a delicate gray. Air was readily forced through the perforation by Valsalva's inflation. W. r. $\frac{48}{48}$ l: $\frac{36}{48}$.

The only treatment ordered was rest and the avoidance of cold, *i. e.* to avoid violent blowing of the nose, etc., and to keep a light pledget of cotton in the meatus. April 20, nearly all the dulness and opacity of the membrane had disappeared, but the edges of the perforation had retracted still further, making the opening wider than before.

April 27, the perforation had closed to about one half its previous size. The patient was suffering from a slight cold and had had a little sharp pain in the ear, but no congestion or other change could be perceived in the membrane.

May 23, the perforation had healed entirely, and the most careful examination failed to develop a cicatrix, or any sign of injury to the membrane, which appeared perfect in every respect. The watch, voice, and tuning-fork were heard equally in the two ears.

(8.) T., merchant, aged 26, was struck on the auricle by a snowball; felt something burst in the ear, and his family physician soon after diagnosticated a rupture of the membrana tympani. That there was a rupture cannot be doubted, for the air could be easily forced through it, and the patient was also in the habit, occasionally, of blowing cigar smoke through. He suffered no pain or other inconvenience from the accident and the rupture soon healed. Some months afterwards I had an opportunity of examining the ears, and found them perfect in every way; there was no cicatrix or other mark to show that any injury had ever been received.

More than a year afterwards the patient was under my care for an acute swelling of both Eustachian tubes, from which he soon recovered, and to the present time has had no further trouble.

(9.) C., laborer, aged 30, was struck by a policeman's club directly on the right ear, fell backwards, and struck the back of the head on a flat stone. Was immediately brought to the City Hospital, June 7, 1871, with bleeding from the right ear and nose. The history is a long one of concussion of the brain and malingering, in which it is difficult to separate the one from the other.

The bleeding from the ear ceased soon after his entrance, and on the 11th I examined it at the request of the attending surgeon; there was only a slight contusion of the auricle, the meatus was filled with dried blood, which was removed, and its walls found intensely inflamed, and so swollen that the membrana tympani could not be seen. The application of leeches and the warm water douche relieved this, however, so much that the next day I could see a rupture of the membrana tympani on its anterior segment, through which a thin, mucous discharge was oozing; the disease in the ear progressed as a purulent inflammation of the tympanum, granulations formed on the edges of the rupture and required to be destroyed with caustic; the rupture closed, and five weeks after the injury he was discharged "well." The hearing could not be tested in the earlier course of the disease; at the time of his discharge the watch was heard at 3″, subjective noises were only slight, and the swelling remaining on the membrana tympani was enough to account for these symptoms. Some ten days afterwards, when last seen, the noises and swelling were still less and the hearing was improving. W. $\frac{8}{48}$.

(10.) F. M., laborer, aged about thirty, fell from a staging a distance of thirty feet, striking on the hands, which he had extended, and then on the head. Was insensible for a short time, but on arrival at the hospital had recovered. He was found to have a fracture of each wrist, a cut on the right side of the forehead over the eye and through the periosteum; there was quite free bleeding from the right

ear of bright arterial blood, and there had been bleeding from the nose. Intellect clear; pulse 64; pupils reacting normally.

The ear ceased bleeding within a half-hour after entrance, and he made no complaint of it till three or four days after, when it began to give him some pain, which continued for several days without discharge and then ceased. At no time were there any head symptoms, and the pulse soon came up to 76.

For a time after the pain in the ear, there were great deafness and violent noises; but both these symptoms had improved. Two weeks after the injury he began to complain of a disagreeable sensation in the ear while talking (autophony), and for this was sent to me.

July 29. Examination showed r. m. t. dull, swollen, opaque, with a slight congestion along the manubrium; just below the umbo was a closed rupture 3''' in length, and running obliquely forwards and upwards, rather more on the anterior than the posterior segment. The membrana below this rupture was somewhat sunken, and the position of the rupture was distinctly marked by effused blood.

W. r. $\frac{3}{48}$. T. f. on forehead loudest in r.

The air-douche per catheter was used, and the membrana tympani came out into better position.

Aug. 2. He reported the autophony gone and the ear clearer. W. r. $\frac{6}{48}$. Air-douche as before.

Aug. 19. Membrana tympani still dull and swollen. No autophony, but the ear still has some feeling of fulness. W. r. $\frac{10}{48}$. Air-douche.

Aug. 26. W. r. $\frac{12}{48}$. Otherwise same. Treatment same.

The patient was not seen again, but the hearing and other symptoms were improving so rapidly that I have no question that they ceased to trouble him.

In the first two cases the concussion of air ruptured the membrana tympani, and this injury was followed by a purulent inflammation of the whole cavity of the tympanum. The ruptures in both healed readily, but in the first case a catarrhal inflammation of the mucous membrane of the tym-

panum remained. This first patient had evidently had a catarrhal inflammation in both ears before the accident, as shown by the position of the membranes of the drums, and by their appearances, and also by the history.

In the third the concussion of air was followed by loud subjective noises in one ear, which were relieved by forcing air behind the drum membrane; but I was unable to discover the cause of the noises. The slight thickening of the membrana tympani on that side might have been the result of some old and slight disease, or possibly the result of the concussion; but observations are yet wanting to show that an inflammation of the mucous membrane of the tympanum may result from such a concussion when the membrana tympani is not ruptured. The immediate diminution in the noises, after forcing air behind the drum membrane, seems to show that the concussion had driven the membrane and ossicula inwards, causing intra-auricular pressure, and some of these structures remained pressing inwards till forced out again into their natural position by the air-douche. Although the membrana tympani appeared in normal position, it is often difficult to affirm this with certainty, and the membrane might have been slightly forced inwards without my appreciating it; but it is more probable that the membrane itself returned to its natural position after the concussion, leaving the stapes pressing unnaturally on the labyrinth. The fact, however, remains, that the noises, after remaining constantly for some three weeks, were immediately relieved and finally cured by the air-douche.

The fourth case resembled the third, except that there was here evidently an old plastic inflammation of both tympana, and the concussion had merely increased the subjective noises which had already existed for some years.

In the fifth case, the patient was evidently subject to catarrhal inflammation of the ears, and from the "rattling," immediately after the explosion, and the sudden "crack," some time afterwards, the ears probably contained mucus at the time of the accident. The course of the disease after-

wards was that of a catarrhal inflammation, either produced by the explosion or by natural causes.

The sixth case is an instructive one, in showing the value of inspection. The explosion having forced the thin and relaxed cicatrices of old perforations inwards against the wall of the promontory, the moist surfaces adhered, causing the feeling of closure in the ears. On one side the cicatrix freed itself, and the disagreeable symptoms were relieved; on the other it remained in contact, till forced outwards by the air driven in behind it.

The seventh and eighth cases show what slight symptoms occasionally follow ruptures of the membrana tympani, and also how perfect the restoration may be. In neither of them was it possible to recognize the position of the rupture after the membrane had healed, nor did any secondary changes in the ear result from the injury.

In the ninth and tenth cases, we have ruptures of the membrane, from blows, followed in one case by a purulent inflammation of the tympanum, and in the other by a simple catarrhal inflammation.

It is an interesting fact to note that in five of these ten cases the ears were undoubtedly diseased before the accidents, as shown by the acknowledgments of the patients themselves, and by the appearances, not only in the injured ear, but also in that of the opposite side.

NOTE. In writing out this paper, I have thought best to omit the two cases of injury from attempted removal of foreign bodies, as one of them was simply curious, from the fact that a small mass of cerumen became impacted in a meatus nearly closed by exostoses, while the second case I was unable to follow, so that it loses its scientific interest. In the first case attempts were made to remove the exostoses by forceps, causing some abrasion but no permanent injury; in the second case, the membrana tympani and both malleus and incus were removed in attempts to get a bit of glass out of the meatus.

TRANSACTIONS

OF THE

American Otological Society.

SIXTH ANNUAL MEETING.

NEWPORT, R. I., JULY 16, 1873.

BOSTON:
ALFRED MUDGE & SON, PRINTERS, 34 SCHOOL STREET.
1873.

MEMBERS OF THE AMERICAN OTOLOGICAL SOCIETY.

Dr. Frank W. Abbott . . . . . Buffalo, N. Y.
Dr. C. R. Agnew . . . . . New York City.
Dr. Rob't M. Bertholet . . . . . Philadelphia, Pa.
Dr. C. J. Blake . . . . . Boston, Mass.
Dr. A. H. Buck . . . . . New York City.
Dr. Chas. H. Burnett . . . . . Philadelphia, Pa.
Dr. J. Solis Cohen . . . . . Philadelphia, Pa.
Dr. John H. Dix . . . . . Boston, Mass.
Dr. John Green . . . . . St. Louis, Mo.
Dr. J. Orne Green . . . . . Boston, Mass.
Dr. Chas. E. Hackley . . . . . New York City.
Dr. J. H. Hinton . . . . . New York City.
Dr. E. L. Holmes . . . . . Chicago, Ill.
Dr. Chas. J. Kipp . . . . . Newark, N. J.
Dr. H. Knapp . . . . . New York City.
Dr. J. W. Lawton . . . . . Syracuse, N. Y.
Dr. W. J. Ludlum . . . . . New York City.
Dr. Arthur Mathewson . . . . . Brooklyn, N. Y.
Dr. W. W. Morland . . . . . Boston, Mass.
Dr. H. G. Newton . . . . . Brooklyn, N. Y.
Dr. Henry D. Noyes . . . . . New York City.
Dr. J. F. Noyes . . . . . Detroit, Mich.
Dr. Charles J. Pardee . . . . . New York City.
Dr. Howard Pinkney . . . . . New York City.
Dr. George B. Pomeroy . . . . . New York City.
Dr. O. D. Pomeroy . . . . . New York City.
Dr. Thos R. Pooley . . . . . New York City.
Dr. J. S Prout . . . . . Brooklyn, N. Y.
Dr. C. E. Rider . . . . . Rochester, N. Y.
Dr. C. A. Robertson . . . . . Albany, N. Y.
Dr. D. B. St. J. Roosa . . . . . New York City.
Dr. W. W. Seeley . . . . . Cincinnati, O.
Dr. Samuel Sexton . . . . . New York City.
Dr. H. L. Shaw . . . . . Boston, Mass.
Dr. Francis Simrock . . . . . New York City.
Dr. H. N. Spencer . . . . . St. Louis, Mo.
Dr. George Strawbridge . . . . . Philadelphia, Pa.
Dr. Wm. Thomson . . . . . Philadelphia, Pa.
Dr. David Webster . . . . . New York.
Dr. R. F. Weir . . . . . New York City.
Dr. Robert Willard . . . . . Boston, Mass.
Dr. E Williams . . . . . Cincinnati, O.

THE AMERICAN OTOLOGICAL SOCIETY.

MINUTES FOR 1873.

NEWPORT, R. I., July 16, 1873.

The Sixth Annual Meeting of the Society was held at Rice's Rooms, Thames St., on July 16th, 1873, at 10½ o'clock, A. M., the President, Dr. H. D. Noyes, in the chair.

Present: Drs. John Green, St. Louis; O. D. Pomeroy, New York; J. Orne Green, Boston; Chas. I. Pardee, New York; D. B. St. J. Roosa, New York; R. M. Bertholet, Philadelphia; C. R. Agnew, New York; Henry D. Noyes, New York; Albert H. Buck, New York; Clarence J. Blake, Boston; George Strawbridge, Philadelphia; C. H. Burnett, Philadelphia; Sam'l Sexton, New York; William Thomson, Philadelphia; Chas. J. Kipp, Newark, N. J.; Herman Knapp, New York; Chas. E. Rider, Rochester, N. Y.; and by invitation, Dr. Argyle Watson, of New York.

The President opened the meeting with a few introductory remarks, and then appointed, as the Executive Committee, Drs. Pomeroy, Strawbridge, and Sexton, with the duty of nominating new members, preparing a bulletin of business, and nominating officers for the ensuing year.

Dr. Green gave notice of a proposed amendment to the By-Laws, viz. to strike out the last part of the first paragraph of the second section beginning "There shall be," etc., and also the whole of the third paragraph of the second section, thus doing away with the office of Corresponding Secretary. He also gave notice of an amendment to the rule for meeting, viz. to make the section read, "'meeting annually,' at such time and place as may be agreed upon each year."

The Treasurer's report was read, and referred to Dr. John Green as the Auditing Committee, who reported it correct, and it was accepted.

The Executive Committee nominated as members of the Society, Drs. Chas. J. Kipp, Newark, N. J.; Wm. Thomson, Philadelphia; David Webster, New York.

These three gentlemen were elected by ballot, and Drs. Kipp and Thomson took their seats as members.

The following bulletin of business was submitted by the Executive Committee, the papers read in order, and referred to the Publishing Committee: —

1. Report on the Progress of Otology. Dr. C. H. Burnett, Philadelphia.
2. Report of Three Cases. Dr. A. H. Buck, New York.
3. Clinical Contributions. Dr. Charles J. Kipp, Newark, N. J.
4. Tenotomy of the Musc. Tensor Tympani. Dr. J. Orne Green, Boston.
5. Therapeutic Value of Tenotomy of the Musc. Tensor Tympani. Dr. R. M. Bertholet, Philadelphia.
6. Cases illustrating the Effect of Paracentesis of the Membrana Tympani. Dr. O. D. Pomeroy, New York.
7. A Case of Hardness of Hearing for Low Tones. Dr. C. H. Burnett, Philadelphia.
8. A Peculiar Manifestation of the Paradoxical Formula in the Application of the Constant Current to the Right Ear. Dr. C. H. Burnett, Philadelphia.
9. Tympanic Trephine. Dr. C. H. Burnett, Philadelphia.
10. Ulceration of the Demoid Layer of the Membrana Tympani. Dr. J. Orne Green, Boston.
11. Reaction of the Auditory Nerve under the Galvanic Current. Dr. C. J. Blake, Boston.
12. Diagnostic Value of High Musical Tones. Dr. C. J. Blake, Boston.
13. Case of Deformity of the Auricle, — the Result of Inflammation. Dr. D. B. St. J. Roosa, New York.

14. Deafness in Consequence of Epidemic Cerebro-Spinal Meningitis. Dr. H. Knapp, New York.

The thanks of the Society were voted Dr. Burnett for his elaborate and faithful report on Otology.

At 2½ o'clock, after the reading of the fourth paper, the Society adjourned to four o'clock.

Second Session.

The Society was called to order at four o'clock by the President, and the minutes of the first session were read and approved. The reading of the papers was then continued till 5¼ o'clock, when, after hearing the ninth paper, the Society adjourned.

Third Session.

The third session was opened by the President at 7¾ o'clock, and the two amendments to the By-Laws proposed at the first session were adopted.

It was voted that one hundred extra copies of the Report on Otology be furnished by the Society to the author of that paper.

The reading and discussion of the papers was then concluded.

Dr. Thomson showed a metallic reflector for use in the army, made of German silver, coated with nickel.

The Executive Committee reported the following list of officers for the ensuing year, all of whom were elected: —

President, D. B. St. J. Roosa, M. D.
Vice-President, Clarence J. Blake, M. D.
Secretary and Tresaurer, J. Orne Green, M. D.
Publication Committee, { Chas. E. Hackley, M. D.
Robt. F. Weir, M. D. }
Committee on Progress of Otology,
Chas. H. Burnett, M. D.
C. J. Blake, M. D.

The same rules as last year were adopted in regard to publishing the papers, revision of proofs, and adjournment.

A communication was received from Drs. Blake, Roosa, and Pomeroy, in regard to an International Otological Congress, and on motion of Dr. Roosa it was resolved, "That a committee of three be appointed by the chair, who shall report at the next meeting of this Society as to the feasibility of holding an International Otological Congress in New York in 1876."

The President appointed as such committee, Drs. Roosa, Blake, and Knapp.

The minutes of the second and third sessions were read and approved, and the Society adjourned at 9¾ o'clock, P. M.

REPORT ON THE PROGRESS OF OTOLOGY.

BY C. H. BURNETT, M. D., OF PHILADELPHIA.

YOUR committee, in presenting the report on the Progress of Otology during the past year, takes pleasure in stating that the amount of new work in our department of science is in excess of that of the previous year. I have endeavored to, at least, record the title of every production relating to Otology, in the Bibliography appended to my report. But time has been too short for a careful review of many interesting papers, which are, therefore, simply recorded in the aforesaid list.

We have gained several special works on the Ear, both therapeutical and anatomical, and a new text-book by Prof. Roosa, of New York, is promised by the first of August of this year. The title of this work will be, "A Practical Treatise on the Diseases of the Ear, including the Anatomy of the Organ." It will be illustrated by wood-cuts and chromo-lithographs.

Through the kindness of the author, I have seen the advance sheets of this work. According to the Index, the book will be divided into four parts, as follows: I. Introduction and External Ear. II. Middle Ear. III. Internal Ear. IV. Deaf-Mutism and Hearing Trumpets.

The lithographic plates present very good perspective features; Nos. 1, 5, 6, and 7, I consider especially good. The accuracy of these pictures is brought out by viewing them through a short tube of any kind, but markedly through an aural funnel.

Those portions of the work which treat of mastoid disease, and the operations for their relief, are copious in interest and information.

The latest discoveries in the anatomy and physiology of the organ of hearing, are amply acknowledged, and the

book is enriched by the labor of the modern microscopic-anatomists.

Dr. Roosa's own rich experience is constantly adduced throughout the work, while the labors of others in our specialty are most generously alluded to, thus rendering the work one of widest range.

Foremost among the works on the structure of the organ of hearing are those of Rüdinger on the Labyrinth, and Waldeyer on the "Cochlea and Acoustic Nerve," in the last part of Stricker's Manual of Histology. Both of these papers have been ably translated, with the entire work containing them, in England and America. (Sanderson, Buck, *et al.*)

Dr. Hasse, of Würzburg, has recently published a new work on the "Comparative Morphology and Histology of the Membranous Auditory Apparatus of the Vertebrates, together with remarks on the Comparative Physiology of the same." The work contains two plates. I regret exceedingly that time has not permitted me to give you a careful resumé of the labors of this distinguished author, but I am confident that the new work is in every way commensurate with the industry and reputation of its author.

We have two works on special features of disease of the ear; the first being a treatise on "Tinnitus Aurium," by Delstanche, fils, of Brussels; and the later one on "Progressive Hardness of Hearing," by Weber-Liel (F. E. Weber), of Berlin, both of which are again referred to further on in my report.

From Paris we have a small work on "Diseases of the Ear," by Levi. Its special feature is its adaptation to the requirements of military surgeons. The colored lithographic plates are very good.

We can pronounce the translation into English, of Helmholtz's "Mechanik der Gehörknöchelchen,"— a most valuable work in Otological literature, as well as one which reflects the greatest honor on its translators, Drs. A. H. Buck and Normand Smith.

In a letter dated April 13th, 1873, which your committee received from Prof. A. Politzer, of Vienna, he informs me, that his plates, illustrative of the anatomy of the organ of hearing, would appear by the end of April of this year, under the title of "Zehn Wandtafeln zur Anatomie des Gehörorgans." He further states in this letter that each plate is to be seventy centimetres long by fifty-seven centimetres high, with a proportionate magnification of the various parts of the organs of hearing. Since receiving this letter I understand that these plates have appeared in Vienna bearing the imprint of the publishing house of W. Braumüller.

The amount of literature contributed to our specialty increases so rapidly, and is of such great worth to those interested in our department, as well as to the general practitioner, that your committee would suggest the appointment of two members, instead of one, to perform the work of reviewing and preparing the productions of authors for the annual report. These gentlemen could easily divide the labor, and the Society would thus gain a much more complete compendium of the advance in our science, which would really serve as a manual for guidance in the practice of daily professional life. It is an experience of the past year, which shows that more is being done each month in our specialty, and the consciousness that your committee presents a report far from being as complete as he could desire, that prompt this suggestion, which, if followed, would give scope to the work of your committee, as well as greater information to the members of the Society.

It is with the deepest satisfaction that we have read the reports on the "Progress of Otology," as they have appeared from the pen of Dr. J. Orne Green, in the "Boston Medical and Surgical Journal," and we express the hope that similar reports from the same source may continue to appear.

The report to which I now call your attention, is similar, in its general arrangement, to that presented last year to the Society, by Dr. Blake. It will be my aim to take up each

point in order, endeavoring to give to each a fair but short review. Although many valuable papers are mentioned only in the Bibliography, it is an indication of a want of time, on the part of your committee, to give them a proper review, and not of any want of merit on their part.

Voltolini has offered to the profession a pneumatic aural speculum, which is a compound of Siglé's pneumatic speculum and Brunton's speculum. With this he proposes to investigate more thoroughly and most boldly the middle ear, after cutting away the posterior segment of the membrana tympani and turning it forward over the hammer. He thus obtains a more perfect view of the fenestræ of the labyrinth and of the stapes. He also proposes to operate with this speculum in situ, by introducing a knife through a slit in the funnel portion of the speculum. He reports one case of tenotomy of the tensor tympani performed successfully by its aid. If the instrument is all the inventor claims it to be, we may consider it a valuable addition to the diagnostic as well as surgical means of otology.

Prof. Voltolini, in the account of the operation for tenotomy of the tensor tympani, performed by the aid of his pneumatic speculum, gives preference to the posterior segment of the membrane as the field for the incision in such an operation, since in that position the surgeon finds more room for movement of the knife. He says, however, that the most important part of the operation, viz the *cutting of the tendon*, must be done unaided by the eye of the operator, who must rely upon a perfect knowledge of the anatomy of the parts concerned in the operation, and his *tactus eruditus*.

Dr. E. De Rossi, Professor in the University of Rome, claims to have invented a binocular otoscope. It is simple and inexpensive, differing very slightly from the original form of Helmholtz's ophthalmoscope. It is so arranged on a forehead-band as to allow the use of both hands, but the distance of the eye from the membrana tympani, necessary to obtain a binocular view (30 centimetres), renders the instrument of no very great practical utility.

Dr. Trautmann has investigated the physics of the concave mirror when used with lenses for the purpose of magnifying the membrana tympani in ordinary examinations. His paper concludes with a list of lenses arranged according to their focal distances, and the distance at which the source of artificial light should be placed.

Voltolini calls attention to an explanation for the formation of the so-called pyramid of light (Licht Kegel) of the membrana tympani. The first indispensable condition for its appearance is a good reflecting surface. But this alone will not produce the "triangular spot of light" so long as the membran is a plane surface, although it may have any inclination to the axis of the external auditory meatus.

Hence, the cause of "the triangular spot of light" is to be found, according to Voltolini, in the concavo-convex form of the normal membrana tympani.

By way of illustration, Voltolini refers to the flower of a convolvulus, or so-called "morning-glory," as a good example of the shape of the normal membrane.

It is at once bell-shaped as well as funnel-shaped. At the centre it is concave; at the edges convex. Hence, the centre, or "funnel," reflects light like a spherical-concave mirror, while the edges act like a convex-spherical mirror. From the reflection of these two mirrors, *i. e.* from the "funnel," results the so-called "pyramid of light." The prominent feature of the explanation is, the assertion that the position of the membrane in reference to the axis of the meatus has nothing to do with the formation of the peculiar reflection in question. The author says this can be produced by taking an ordinary tin funnel, found in every household, and holding the wide-mouthed end towards the window. Then, we should instantly see the "pyramid of light," and we continue to see it, although we may hold the wide mouth of the funnel towards the floor. The "pyramid" will simply be a little fainter in the latter instance.

In a living man, the concavity of the membrane, as a rule, plays the greater part, in the formation of the "pyramid of

light," because the light can rarely pass into the meatus in such a way as to enable us to see at the same moment the reflection caused by the concave and convex portions of the membrana tympani.

Since the concave portion of the membrana tympani receives most readily the light entering the meatus, we obtain its reflection only, and hence see the "pyramid of light" at the under part of the membrane only. The apex of the pyramid is seen at the point of the manubrium of the malleus, and its base at that point where the concavity of the membrane fades into the convexity of the membrane. This is seen in the membrana tympani, removed from the meatus, so long as the funnel shape is preserved.

That the convexity of the membrane in certain positions will produce a "spot of light" is seen in the membrana tympani of the bird, which is convex outwardly. On the prominent hillock thus formed we can see a pyramid of light when holding the meatus of the bird towards the light. In such a case it is manifest that the membrana tympani has a form widely different from the concave membrane of man.

Politzer, in his work on the Membrana Tympani (Beleuchtungsbilder des Trommelfels, 1865), says that the image or reflection in question is the result of the shape of the membrane, produced by traction inwards; that a plane shining surface will not produce it, and that the inclination of the membrane is not the cause of the "pyramid of light." The explanation given then by Politzer is essentially the one now offered by Voltolini.

Zuckerkandl has contributed an interesting paper on the development of the external meatus auditorius. He describes a new point of development in the annulus tympanicus, between the spina tympanica antica and the spina tympanica postica, which he denominates tuberculum tympanicum anticum. On the anterior edge of the posterior limit of the annulus, but deeper down than the tuberculum tympanicum anticum, is another bony process and point of development, which he calls the tuberculum tympanicum posticum.

It is by the development and union of these tubercles that the external meatus is formed, or a defective development of the passage is due to a want of union between these points of bony growth.

Between the 20th and 30th year the external meatus is in its most perfect condition.

Between the 30th and 40th years the meatus may show defects in the bone, which increase with age. Defects of the meatus, which can be traced to arrested development of the os tympanicum, belong to the greatest rarities. Among a thousand cases the author found but two.

The causes of these defects are: —

1. Atrophy of the bone.

2. Pressure of the head of the inferior maxilla, especially in those with defective alveolar processes.

3. Pressure from the head of the inferior maxilla upon the anterior wall of the external auditory meatus, induced by a too great convergence in the articular cavities of the temporal cartilage.

4. In rare cases, persistence of physiological defects occurring during the development of the external auditory meatus.

The attention of the profession has been called, in several instances (Dr. J. Solis Cohen, Phila. Med. Times, No. 79, 1873; Dr. C. H. Burnett, ibid. No. 81, 1873) during the past year to a peculiar irritative cough called "ear cough."

This name has been applied by Dr. C. B. Fox, of Scarborough, England, to a cough caused by irritation of the external auditory canal. He says: With the object of ascertaining the percentage of those subject to this sympathetic peculiarity, one hundred and eight persons have been examined by myself and others under my direction, with the following results: males examined, thirty-seven; females examined,. forty-five; sex not noticed, twenty-six; total, one hundred and eight.

Cases in which a sensation of tickling in the throat and cough were occasioned by a titillation of the auditory canal,

twenty-two; cases in which nausea was *alone* produced, three. In one of the cases of irritation of the throat with cough, *nausea* was also complained of; and in another of that number vomiting was said to be sometimes produced. In conclusion, Fox's observations are thus summed up:—

1. From amongst the unknown group of idiopathic coughs, may happily be rescued from obscurity a cough which is excited by an irritation of the meatus auditorius externus in certain individuals.

2. The persons referred to are those who possess a hyperæsthetic condition of the nerve supplying that canal, and in whom any slight titillation of this nerve induces a feeling of tickling in the throat.

3 This hyperæsthetic state generally exists in both ears, sometimes, however, only in one, and occurs in about twenty per cent of those examined.

4. Its existence can usually be traced to childhood, and is probably a congenital peculiarity.

5. The nerve of the ear concerned in the production of ear-cough, is not a branch of the vagus, as Romberg and Toynbee have affirmed, but is a branch of the auriculo-temporal branch of the fifth cranial nerve.

6. This sympathy between the ear and the larynx is an example of a reflected sensation, in which the connection between the nerves involved takes place in the floor of the fourth ventricle.

7. Vomiting is occasionally, but rarely, the result of the application of an irritant to the nerve distributed to the auditory canal.

Dr. Denton, who assisted Dr. Fox in his examination of patients, found in one case (a woman twenty-four years old) that vertigo alone was produced by a titillation of the external auditory meatus. In another case, a woman about thirty years of age, tickling in the throat, cough, and nausea were produced by an irritation of the left ear "whilst vertigo was only experienced when the right ear was experimented on."

Dr. Denton says that neither of these women was hysterical, nor in a fanciful nervous condition. He believes them to have made thoroughly reliable statements.

Dr. Dobell, in his new work on "winter cough," says that he can confirm the statements of Dr. Fox, from personal observations.

Brown-Séquard, in a lecture "On the Origin and Signification of the Symptoms of Brain Disease," delivered in the amphitheatre of the University of Pennsylvania, on the evening of October 10, 1872, said that othæmatoma has a nervous origin. This variety of tumor is the result of disease at the base of the brain, and is usually found in the paralysis of the insane. It may be produced artificially in animals, and this he has done in less than one night, between the hours of ten in the evening and six o'clock in the morning. He has performed the same experiments, and kept the animal *under his own eye*, until the artificially produced tumor made its appearance. This he accomplished by an irritation applied to the restiform body, on the side corresponding to that of the tumor. In these cases the process thus excited in the ear may pass rapidly into gangrene, so powerful is the effect of the irritation of the restiform body. The lecturer also drew attention to the fact that tumors (othæmatoma) usually occur, in the insane, on that side corresponding to the affected side of the brain, which proves that they cannot be, at least not always, the result of violence on the part of the patient or his attendants; since violence of any kind would not, invariably, be applied to the side of the head nor the ear, corresponding to the affected side of the brain.

Another valuable paper on this subject is one entitled hæmatoma auris, by W. Yeats, M. D., of the Coton Hill Institution for the Insane, England. This paper contains a short history of valuable articles on the subject by other authors.

We are informed that the cartilage is the seat of the affection, and hence the lobule of the ear always remains intact. A

good description of the symptoms is given, which will aid in forming a correct diagnosis. The natural course of the disease is rapid. It is usually developed in from four to six hours, which statement agrees fully with the experimental observations of Brown-Séquard. The tumor fades away in a week or ten days, although it may last one month. The blood is effused between the cartilage and the perichondrium, and may then become organized into a hard tumor, which at "last shrivels up and leaves the ear with a puckered appearance." According to the writer of the article under consideration, hæmatoma auris is not prejudicial to hearing; but may, in fact, render it sharper, as in the case of one of the patients in the Coton Hill Institution. This disease is not confined to any peculiar form of insanity, although it is frequently found in dementia. The author distinctly says it never occurs in the sane. The prognosis of mental recovery in those affected with this malady is extremely unfavorable. The author knows of but one case, and this he relates as occurring in his own practice. The patient, a married female thirty-three years old, was admitted to the aforesaid institution, for insanity. Thirteen months after her admission, in the midst of every variety of bad symptoms, hæmatoma auris appeared, and after running its usual course, disappeared. Finally the patient began to manifest symptoms of mental recovery, and in the month of February, 1873, was discharged from the asylum perfectly restored in mind, after three years of insanity.

Prof. Ludwig Meyer, in an article referring especially to Darwin's idea, that the common, small projections in the helix of the ear are remnants of the pointed ear of certain Simian races, says that too much importance has been attached to the deviations in the form of the concha, — much more, in fact, than the unimportant physiological functions of the organ justify.

It has already been noted by previous observers that malformations of the external ear are found in the greatest

number, in connection with arrested development in the region of the first (Kiemenspalte) branchial fissure, viz. with cleft palate, and other forms of retarded development in the bones of the head and face. The explanation of Virchow, that these changes are due to inflammatory processes in the earlier days of fœtal development, seemed sufficient to Meyer, until, as he says, he instituted a careful examination of the form and position of the external ear, in a number of insane people, manifesting those peculiarities described and called by him cranium progenicum. In all these cases there was a relative arrest of development of the bones of the face, especially a malformation of the inferior maxilla, and it should be borne in mind that the inferior maxilla is formed through ossification in the membrane of the branchial arch. (Kiemenbogen.) The expectation of finding, in just such cases, characteristic forms of the ear, was not realized, and the theory appeared the less tenable, the further the investigation was extended to numerous cases of both the insane and the sane. Pathologically, the result of the investigation is considered by Meyer to be unimportant, but he expresses a belief that the significance of the form and position of the external ear is purely of a physiognomical character.

In connection with a beautiful, well-formed face, we usually find a round, well-formed, small, and close-lying ear, whereas, in macrocephalic heads we find large massive ears, in some cases real elephantine ears, while the narrow ear, directed backwards, the so-called Faun's ear, accompanies a low, retreating forehead, sharp nose, and narrow chin. A comparative examination of normal male heads seems to indicate that the position of the ear possesses a certain and constant relation to the architecture of the skull; for female heads, with a good facial angle, show a more vertical position of the concha, whereas these relations are altogether different in females and in children.

In women and children we often find, in connection with a large facial angle, obliquely placed ears, so that the upper

part of the helix points backwards, and the posterior portion is directed downwards. The cause of this is to be sought for in the relation of the *ramus* to the body of the inferior maxilla, rather than in the relations of the superior maxilla and the frontal bones to each other. The explanation of the connection between the position of the ramus of inferior maxilla and the external ears is to be referred to the development of those portions of the face from the same part of the (Kiemenbogen) *branchial arch.* Not only the position of the ears, but the elevations and depressions of the auricle, vary even in the same individual.

Comparatively frequent we find irregularities in the edge of the helix. To one of these, more prominent than the others, Darwin has attached the significance already alluded to. Now, the edge of the helix is rarely completely smooth, and even when any slight inequality of the concha escapes the eye, the finger can readily detect it. These are really deficiencies and not absolute prominences, and the wider the loss of substance in the helix cartilage, the more prominent will the remaining portions appear.

If, in an ear where one or two such prominent remnants of the helix occur, a line be drawn joining them, it will correspond with the outline of the normal helix. That these prominences are nothing more than remnants of the helix, is proven by the fact that their inclination, curve, etc., correspond entirely with the curve of the helix.

That part of the helix which affords the most examples of the peculiarity referred to by Darwin is most adapted to producing the longest points, since it is the widest portion of the curved helix. These changes in the ear are doubtless not produced during life, but are congenital. They are found in perfection in little children, and are more apt to occur in males than in females. According to Kollman the helix is not a separate point of development. The auricle consists originally of those formative parts which can be distinctly recognized at the end of the sixth week of fœtal life,

as tragus, antitragus, and anthelix. From the latter the helix is developed. Hence we see that as interferences in the development of the tragus may cause the presence of a cleft in it, so may disturbances in the development of the anthelix cause deficiencies in the helix.

Voltolini contributes the account of another foreign body impacted in the ear, removed by means of galvano-caustic. By employing this means we have a ready way of breaking up the foreign body, and thus facilitating its escape. When a foreign body is wedged in the meatus, the swollen walls tend to push it out, but the body itself, having swollen, cannot escape by the way it entered the ear; therefore it must be made smaller before it can be extracted with comfort or safety to the patient.

By removing portions from the centre of the foreign body, the outer surfaces will approximate, *i. e.* the whole mass will become smaller, and the swollen walls of the meatus will then tend to push it outwards as already stated.

The forensic aspect of traumatic rupture of the membrana tympani has been treated by Prof. Politzer. In this connection there are two points to be considered: —

First. Is there any injury of the membrane present, and if so has it been induced by the asserted cause?

Second. Is the injury trivial or important?

The usual method of producing the injuries in question, is by an ordinary "box on the ear," and if the case is examined soon after the blow, we may detect the injury, if it exists, and pronounce upon the cause which has produced it. As a rule, the wound produced by a blow on the ear gapes constantly, and is usually found in the postero-inferior portion of the membrane. The shape of the opening may be either round or oval, the latter with its long axis parallel with the radial fibres of the membrane.

Most of the traumatic ruptures of the membrana tympani are harmless in their effects. No treatment excepting protection by cotton from cold air, is to be applied to the ear.

In very rare cases the injury may produce a suppuration in the middle ear.

If the injury is uncomplicated with a concussion of the labyrinth, the recovery will be complete.

F. E. Weber-Liel has at last published his long-promised book containing his highly original ideas on the Eustachian tube, its muscles and fasciæ, and the part they play in "progressive deafness." His book contains two hundred and five pages, with six wood-cuts, and four lithographic plates. The work is divided into introductory remarks on disturbances in motility of the muscular structures of the pharynx and Eustachian tube. The latter elements the author considers as the essential and continued causes of the production of the most extensive form of progressive deafness. The first chapter treats of the symptoms and course of this form of disease. The second part of the work treats of the pathogeny of the disease, and is divided into three heads, as follows: —

A. Anatomical relations of the Eustachian tube and its muscles to the tympanum.

B. The physiological relations of the described parts in their connection with the apparatus of the middle ear.

C. Analysis and explanation of the form of deafness, under consideration, based upon the anatomical and physiological facts given.

The third part treats of the ætiology and the pathological conditions.

Fourth part contains the treatment; and the fifth and last part contains histories of cases.

In the introductory remarks the authors says that "he is forced to conclude that the present theory concerning the nature and the origin of the most frequent and important disturbance of the hearing is incorrect." While admitting that almost all deafness, with its accompanying subjective manifestations, may be referred to chronic affections of the middle ear, he is unwilling to admit that all affections of the mid-

dle ear are of a catarrhal nature, and hence rejects the name, "dry or chronic catarrh of the middle ear," entirely as a false denomination.

Weber-Liel's views may be thus summed up, viz. that not only primary and secondary affections of the mucous membrane of the middle ear, but also diseases of its muscles and bones, and especially diseases of the nerves supplying it, may produce a long series of the most dangerous forms of progressive deafness with all its peculiar subjective symptoms.

Among the most fruitful sources of such affections, he mentions neuroses of the trigeminus, disturbed functions of the sympatheticus, the vagus, the glosso-pharyngeus, the facialis, the auricularis magnus, and accessorius nerves. Spinal irritation in females, as well as disease of the naso-pharyngeal mucous membrane, may also complicate a disease of the ear. In the latter part of the introduction, the author says: We must also bear in mind how many affections of the middle ear, which are placed among acute and chronic affections, are really of a rheumatic nature, and appear with such affections in other parts of the body, or substitute them. Since the author has marked out a new theory of diagnosis, he has therefore sought a new method of treatment, and has obtained very satisfactory results, by the use of both constant and interrupted electric currents, applied to the muscular and nervous structure of the throat and Eustachian tube. All of the author's ideas are exceedingly instructive, and at the same time we must bear in mind that he is treating of the most opprobrious subject connected with the practice of Otology.

Dr. C. H. Burnett has published notes on three cases of ear disease where relief was obtained by the use of the knife. Two of these cases were of progressive deafness, one with synechiae of the membrana tympani, attended with simple retraction of the membrane. In the first case, incision through the synechiae, and in the second case incision through

the posterior fold of the membrane (according to Politzer), caused marked improvement in hearing.

In the same article, Burnett reports a case of acute suppurative inflammation of the middle ear, speedily relieved and entirely cured by paracentesis of the membrana tympani, at the postero-inferior segment.

Dr. Burnett (10) has also published the results of further investigation into the comparative distribution of blood-vessels of the membrana tympani, with the following conclusions: —

1. There is a distribution of blood-vessels in the human membrana tympani peculiar to man.

2. There is a distribution of blood-vessels in the membrana tympani of the dog, the cat, the goat, and the rabbit, constant in, as well as peculiar to them.

3. A distribution of blood-vessels exists in the membrana tympani of the Guinea-pig peculiar to it.

Prof. Gruber has written an article on the choice of the point of incision in the operation for tenotomy of the tensor tympani. He alludes to the great services of F. E. Weber-Liel, connected with the introduction of this operation into otological surgery, and while agreeing with him that usually the incision in the membrana tympani may be made in front of the short process of the malleus, says that in some cases the incision can be made more advantageously behind the handle of the malleus, for in this position the tendon can be more readily reached than from a point in front of the malleus. His reasons for these views are as follows: The rostrum of the semi-canalis musculi tensoris tympani varies in its position in the tympanum, being sometimes over the anterior segment of the upper arch of the oval window, — or it may be over it, — and in some cases it may be over the posterior segment of the oval window. The direction of the tendon as it passes from the rostrum cochleare to the handle of the hammer must vary greatly according to the position of the former bony process, and accordingly the handle of the hammer

in cases of retraction will have a variable appearance. If the rostrum cochleare is placed far backward, the hammer will appear driven more backward and inward than if the aforesaid rostrum is situate farther forward, then the handle of the hammer will appear to be drawn directly inward. In the latter case the anterior segment of the membrana tympani will not appear to be so large as it does in the former case, where the handle is apparently drawn far backward and upward. Hence, Gruber concludes that no positive rule can be established respecting the choice of a point for incision, most likely to reach the tendon of the tensor tympani muscle; but the variable relations in the membrana tympani, and especially the position of the manubrium of the malleus, must aid us in deciding where the incision should be made.

Carl Frank, of Würtemberg, has performed tenotomy of the tensor tympani, with some modifications of the method recommended by F. E. Weber-Liel, the inventor of the operation.

Frank's first step, especially in a narrow meatus, is to make a free incision from the short process of the malleus to the umbo. Through this opening he inserts his tenotome, somewhat different from Weber-Liel's instrument. The hook of the blade is passed behind the tendon, and the tendon is severed by turning the hook-blade forward.

Rüdinger has published a sketch of development of the bony canals in the neighborhood of the um. tympani.

He first alludes to the formation of the carotid canal, and then the canalis Fallopii. He promises a large work at no distant day, which will treat of the development of the canaliculus chordæ, canaliculus tympanicus, c. mastoideus Arnoldi, the bony portion of the Eustachian tube, and the semi-canalis tensoris tympani.

In the meeting of the Berliner Mediz. Gesellschaft, July 5, 1873, Erhard spoke upon the worth of operative interference in diseases of the cavum tympani. He stated that this cavity contains only two factors of importance, viz. a

delicate isolated membrane connected with a heavy, isolated, vibratile staff (Stab.), *i. e.* the chain of ossicles. The two together form only two anomalies in disease, viz. defects in the membrane, and insufficient isolation.

Topographically, the cavum tympani is higher than the membrane, and the staff already alluded to swings above the latter out of sight. In its condition of mobility it is sustained by the membrane. Hence, after otorrhœa, defects in the membrane alter the position of the staff; want of air in the cavity of the tympanum produces a similar defect. In the first instance, we may replace the chain of bones by means of a falsely, so-called, artificial membrana tympani. In cases of sudden hermetical closure of the tympanum, we overcome the consequent collapse of the membrana tympani by blowing in air, or by means of an incision in the membrane. Disturbances in the drum are often of a mechanical nature, without cellular changes, and are caused by a want of air in the cavum tympani. Hence, sneezing, gaping, etc., often relieve suddenly deafness of many years' standing. Therefore, when this deafness is ascribed to a collapse of the membrana tympani, and an incision is made into it for the purpose of relieving it, relief may be obtained, but simply because we have opened the cavity of the tympanum to the entrance of air. The same thing occurs when we cut through certain folds in the membrana tympani, which folds are also present when the hearing is normal. If the collapse has led to adhesions between the membrana tympani and the walls of the tympanum they must be overcome,

These statements of Erdhard call to our minds the labors of Politzer in this field of Otology. He has performed the operation of cutting through the posterior folds of the membrane, and at other points, for anomalies in the tension of the membrana tympani, not only with great success, but also to him belongs the originality of their publication.

A case of malignant disease of the naso-pharyngeal cavity, which had progressed so far as to injure the hearing on the

left side, is reported by Voltolini. This impairment of hearing had been attributed to "a cold in the head," until the rhinoscope revealed the true cause of disturbed function. The major portion of the malignant growth was removed by the galvano-caustic; but infiltration of the pharynx had already set in, and the patient died on the eleventh day after the operation, and seven weeks from the time the patient first noticed change in the condition of the naso-pharyngeal mucous membrane, and the altered function of hearing.

The author closes his article with the following words: "Can the mouth of the Eustachian tube be entirely closed where the patient retains still the ability to hear a watch a distance of one inch, or should we expect in the case of such a closure complete deafness? I believe the tubal opening was entirely closed, for I was never able to see the mouth by the use of the rhinoscope, and furthermore we might conclude in a case of such great morbid growth, *a priori*, the mouth of the Eustachian tube was closed. I am, therefore, forced to conclude that complete deafness can only occur in a lesion of the labyrinth, and not *in any case* of closure of the Eustachian tube, of adhesions in the external meatus or cavity of the tympanum, or in a destruction of the membrana tympani."

In some cases of so-called dry chronic catarrh of the middle ear, Lucæ recommends a few drops of a solution of choral hydrate (10 : 30), introduced into the middle ear by means of the Eustachian catheter and the air douche. Then generally follows a severe but short reaction In the best cases, after the second application, an improvement in the hearing is noted. If no improvement is seen after the twelfth application, we may expect none from the use of this remedy. In ten per cent of all cases the improvement was marked; in twenty-five per cent, slight; and in sixty-four per cent, no improvement occurred.

Dr. Seyfert, of Odera, has written a continued paper on the "Various Applications of the Irrigation Apparatus."

In it he alludes to the use of that form of the apparatus known as the "nasal douche." Its discovery he attributes to E. H. Weber, while that investigator was making his experiments on the organs of smell.

Theo. Weber, of Halle, was the first to utilize the fact that a stream of water passed through one nostril will escape through the other, after passing through the naso-pharyngeal space. This is due to the well-known reflex effect upon the velum palati, causing it to retract, and shut off the naso-pharyngeal space from the pharynx. Dr. Seyfert lays down three leading principles, to be observed in the application of the nasal douche : —

1. The vessel containing the fluid to be injected must not be higher than the forehead of the patient.

2. The forehead must not be inclined forward too greatly, for if it be the fluid enters the frontal sinuses.

3. The fluid used in each case must be tepid, and in bad weather the patient should not leave the room for one quarter of an hour after the use of the douche.

Dr. Seyfert says that he has never known a case of secondary inflammation to occur when these rules have been observed. The writer alludes to the fact that Profs. Moos, Knapp, and Roosa have written in unfavorable terms of the use of this means of treatment; but as he has seen numerous cases of the use of the nasal douche in the clinic of Prof. Wendt, in Leipsic, without any accidents, he thinks there must have been some error in its use in the case related by Prof. Roosa, in Vol. 1 of Moos and Knapp's Archives, especially in regard to the height of the vessel above the forehead. Everything in such cases depends upon one point, according to the writer, viz. the hydrostatic pressure. If the vessel is higher than the patient's forehead, the error may be vital.

Prof. Gruber does not pronounce positively against the nasal douche of Weber, but thinks it may be on *a priori* grounds less safe than his method of applying medicated fluids to the nares, by direct syringing.

If his method is used, the surgeon can more readily control the force of the injected fluid, which can be augmented sufficiently to throw it into the tympanum or mastoid cells, or applied so gently as to reach only the naso-pharyngeal space. Another point of great difference between Gruber's method and that of Weber is, the interrupted stream of the former. This interruption of the stream allows the patient an opportunity of noticing the condition of the ears.

In Gruber's method, only two fluid ounces are injected at once, which small quantity can be injected with greater or less vehemence according to need. Gruber always examines the membrana tympani after the application of the douche. Since the injected fluid always manifests its effects very distinctly upon the membrana tympani, it furnishes us with an index of the amount of irritation and reaction to be looked for.

The air douche should be used immediately after the application of the fluids by the syringe, if their effects are to be modified in the tympanum, for the air will displace some of the fluids and neutralize their effects.

We now come to the consideration of mastoid disease, a subject which claims more attention each year, and to the pathology, diagnosis, and treatment of which the most valuable contributions have been made during the past year.

Dr. Samuel Ashhurst has published an account of a chronic purulent discharge from both ears, ending in disease of the mastoid cells and other cranial bones, the occipital, temporal, and parietal bones being extensively diseased. The disease dated back to 1868, when the patient was twelve years old.

He was admitted to the Episcopal Hospital, in Philadelphia, in September, 1872, for "vomiting, diarrhœa, and a swelling behind the right ear." The man was placed in bed and closely watched. Pulse and temperature continued high until October 13th, when the temperature fell to 95° F.

On October 20th the symptoms became graver, pulse and temperature very high, and congestion of the skin, confined

to left half of body and right leg, became very marked. This congestion continued well marked during life. Convulsions on the 2d of November, and death on the following day.

Since the 9th of October, or nearly one month, a discharge had been kept up from an opening in the scalp. On the 2d of November, the day preceding death, the necrosed bone was trephined with a small crown. A cessation of convulsions ensued, and the pupil became normal, although the discharge of pus from beneath the bone was very slight, at least, so far as could be detected midst the great infiltration of all the parts by pus. Dr. Ashhurst says: The post-mortem examination was made the day following the death of the patient. The membranes of the brain were very moderately injected on their postereir half. The occipital, temporal, and parietal bones were found to be extensively necrosed.

The disease was limited externally to the inf rior angle of the right parietal bone, and to the temporal bone. Internally, it had invaded the occipital bone in the region of the right lateral sinus, considerable erosion and excavation having taken place there, which extended forward to the under surfaces of the petrous portion of the temporal bone, and in this locality two perforations, about one quarter of an inch in diameter, had penetrated to the exterior of the skull; patches of superficial erosion were noticed upon the parietal and temporal bones, stained and slightly roughened. Externally, the inferior angle of the parietal bone had undergone exfoliation, as was also the case with the squamous portion of the temporal bone. The mastoid process was extensively eroded, especially at its upper part, where the perforations were situated.

Dr. Ashhurst's reasons for trephining the bone at the point chosen, were the already diseased condition of the bone, and the inference drawn by him that the lateral sinus was displaced and filled with coagula.

In conclusion, Dr. Ashhurst says: The specimen affords an illustration of how easily a trephine may be applied to a

diseased external table and yet miss an internal abscess. Had I known of the existence of the large perforations revealed in the specimen, no operation would have been undertaken, as mechanical compression could hardly have existed. It is certainly remarkable that with such extensive disease of the bones, there should have been so little meningitis.

Through the kindness of Dr. Ashhurst, Dr. Burnett exhibited to the society the pathological specimen of the cranium furnished by this case.

The specimen is in the cabinet of the Episcopal Hospital of Philadelphia.

Dr. G. C. Harlan reports a case of fatal otorrhœa, in a female twenty-one years old. The discharge had existed for many years, — in fact, since childhood. Great pain and tinnitus aurium occurred about a month before the fatal termination of the disease. Twenty-two days after the first symptoms of pain, a copius discharge of pus occurred from the meatus, and from an incision which had been made over the mastoid process. After this, the pain and tenderness in the meatus disappeared. But violent pain in the forehead, temples, and top of head was complained of, attended by nausea, vomiting, and insomnia. The woman died thirty-six days after the initial symptoms. The post-mortem examination revealed a large abscess filled with more than an ounce of greenish pus, in the middle lobe of the cerebrum, on the left side, resting on the os temporis. The membranes were perforated.

"The temporal bone was removed and macerated for further examination. It was then found that nearly one half of the roof of the tympanum, from the entrance of the Eustachian tube backwards, was destroyed."

The opening from the tympanum to the mastoid cells was very much enlarged, and the upper wall of the horizontal portions of the cells was carious, and contained several large holes. The upper and posterior wall of the bony meatus was "honey-combed," and several small openings communicated

with the mastoid cells. *The mastoid process was very imperfectly developed, and the vertical cells were not formed.*

In a case of disease of the ear, followed by abscess of the brain, related by E. H. Clarke, of Boston, the chief point of interest is the rapid occurrence of brain disease after the acute ear disease. The diseases of the ear producing abscess in the brain are usually of a chronic nature.

Other points of interest are: "The existence of so large a lesion in the brain without marked derangement of sensation and motion," and the slow and intermittent pulse, caused probably by the pressure of the abscess on the medulla oblongata.

Mr. John Wilkins reports two cases of inflammation of the lining membrane of the mastoid cells, with suppuration. He perforated the mastoid wall with a knife, and success attended the operation. In most cases of this nature, the knife would prove a dangerous instrument for perforation, from the liability, engendered by its shape, to perforate the cranial cavity.

Dr. A. H. Buck has contributed a very valuable treatise on diseases of the mastoid process, their diagnosis, pathology, and treatment. The diseases of the mastoid process, according to this author, may be recognized under the following forms: —

1. Inflammation of the external periosteum.
2. Simple congestion of the mucous membrane.
3. Congestion and filling up of the cells with a reddish, pulpy material.
4. Chronic subacute inflammation of the mucous membrane, with sclerosis or hyperostosis.
5. Caries, with accumulation of pus, within the mastoid process.

Dr. Buck gives a very interesting account of a large number of cases illustrative of this disease, and a statistical note of sixty-seven cases, in which mastoid disease was shown to be present. Thirteen cases occurred in children under ten years of age; twenty-six in persons between the ages of

ten and twenty-five; nine in persons between ages of twenty-five and forty; twelve in persons between ages of forty and fifty-five; seven in persons between ages of fifty-five and sixty. The youngest patient was eight months old; the oldest, sixty-two years.

More than half of the patients were under twenty-five years of age. Six of the cases belonged properly to the third form, two were doubtful (third or fifth), and the remainder belonged to the fifth. Of the entire number, three terminated in a spontaneous recovery; twenty-two were operated upon and recovered; eight were operated upon and died; and the remainder, thirty-six in all, terminated fatally. All the cases of spontaneous recovery occurred in persons under sixteen years of age. In performing the operation of trephining the mastoid process, the author gives the following steps: —

A free vertical incision should be first made through the integuments and periosteum of the mastoid bone. The condition of the bone should then be noted. If it be soft or roughened, an attempt should be made to break through the outer lamella by firmly pressing upon it with the end of a steel director. If pus be found between the periosteum and the bone, search should be made with a bent probe for a sinus through which the pus may have found an escape from the mastoid cells. If such a one can be found, apply the drill or trephine at this point, and simply enlarge the existing opening. If no opening be found, dissect up the periosteum from that portion of the mastoid process which is situated immediately behind the external auditory canal, and apply the trephine or drill at a point a quarter of an inch distant from the canal, and a little below the level of its upper wall. The only danger connected with the operation is that of wounding the lateral sinus.

The drill should be rotated in a direction inwards, forwards, and a little upwards; that is, nearly parallel with the canal. The depth to which the instrument should be carried will vary in different cases. The aim should be to reach the

peculiar cell structure of the mastoid process. Ordinarily the fragile cell-structure will be found at a depth of a fifth of an inch. The drill can then be withdrawn, and the steel director used to break down the bony septa.

In the interesting paper upon the artificial opening of the mastoid process, by Schwartze and Edysell, of Halle, we find the history of the operation carefully treated. It appears that Jasser was not the first surgeon who trepanned the mastoid process, although the operation bore his name for a long time.

According to Forget (L'Union Medicale, 1860, 52), T. L. Petit was the first surgeon who performed this operation. Since his time the operation has been successfully performed abroad, and very recently it has been both successfully performed and most carefully written upon by Dr. A. H. Buck, of New York city.

(Archives of Oph. and Otol., Vol. III, No. 1, 1873.)

Petit performed this operation before 1750, upon the mastoid process, which resulted in recovery. The first was done with a hammer and chisel; the second one with a perforator.

The historical part of this paper is full of interest, but the author's lament, that the literature on this subject has been neglected, is well founded. The conclusion drawn by the writer is, that the perforation of the externally healthy mastoid process is not so trifling as some have imagined.

In the second portion of this valuable paper, the anatomy, physiology, and pathological anatomy are carefully treated. The wood-cuts representing various sections through the mastoid cells, are beautifully made and filled with instruction. In concluding this part of the paper we find these words: Since in very many cases nature alone cannot produce a cure, and since, on the other side, the person afflicted with a constant purulent inflammation of the mastoid cells is always exposed to the danger of falling a victim to a severe consequential disease, the necessity of operative interference has been recognized for a long time. In alluding to the means for performing the operation, the authors say, that in

most cases the outer shell of the skull offers no great resistance to perforation. All kinds of instruments may be and have been used with success, but the authors of the paper under consideration give the preference to the gouge.

The gouge is preferred because it is applicable on most surfaces, makes less injuries to the adjacent parts, and even accomplishes all that is desired, even in those cases where, in consequence of sclerosis or hypertrophy of the bone, extraordinary difficulties are presented to the operation. By the use of the gouge, the mastoid antrum can always be found, even where the usual air cells of the process have disappeared.

Since the former is rarely, if ever, wanting, the boring instruments are condemned because the small pieces of bone, or "bone-dust," which they produce, are very apt to be worked into the Eustachian tube, and become imbedded at the isthmus, especially in those cases where the membrana tympani is imperforate. We can only say that as a rule no case would seem to require perforation of the mastoid process where neither nature nor art had perforated the membrana tympani. Among other disadvantages of borers, is the small opening which they in the end, make. This does not allow the proper amount of irrigation; and hence, when these instruments are used, the author thinks he has found a greater tendency to erysipelas and absorption of pus. Therefore trepan-crowns are more useful than borers, because they make a larger opening. It will be borne in mind that Buck recommends the use of a borer to a certain extent, and then a use of crowns, or gouges, to widen the opening the pyramidal borer has commenced. Such a procedure would surely obviate the necessity as well as the danger of going too deep with a pyramidal borer.

Dr. E. Politzer communicates a case of simple catarrh of the middle ear, which presents some rare features. There was a total want of perception of sound, both by the way of the external meatus and the bones of the head, which is explained by Politzer as arising from the pressure of a mass of

mucus upon the base of the stirrup, which caused a temporary paralysis of the terminal branches of the acoustic nerve. By the use of Politzer's method of inflation, the hearing power increased partly, and the author therefore advises us to defer all conclusions drawn from the use of the tuning-fork until we have made a complete investigation of the external and middle ear.

Dr. O. D. Pomeroy, in a record of cases of diseases of the ear, has shown the beneficial results of strong solutions of nitrate of silver, as suggested by Schwartze. In several cases, Pomeroy has used a saturated solution of this salt with advantage.

James P. Cassells has contributed a very interesting and useful paper on the treatment of exanthemal catarrh of the tympanum, in which he has shown the importance of accurate diagnosis and prompt treatment in those cases where exudation collects in the tympanum, but does not burst through the membrana tympani. The cases treated by the author were of scarlatina, in which the ear disease was not fully developed until the exanthemal disease had disappeared. In those forms without perforation both chronic and acute, the writer advises paracentesis which he has used with great success. In the acute cases the discharge usually ceases soon after the paracentesis. In the chronic forms the discharge may be very tenacious, and only extracted by syringing the tympanum per tubam.

The author ascribes a peculiar diagnostic appearance to the chronic form of disease of the tympanum after scarlatina.

Dr. Jacobi communicates the histories of fifteen cases, in which he has successfully used the galvano-caustic for the destruction of polypi and granulations. The method is recommended in those cases where the snare cannot be used.

Dr. Ogston has contributed the result of observations made upon two hundred and twenty-nine cases of variola, in these words: In variola, the structures of the ear are not affected.

It appears, therefore, that although the external meatus and the pharyngeal opening of the Eustachian tube may be affected with the pustules of variola, the specific changes do not occur in the deeper parts of the structures already mentioned, nor in the cavity of the tympanum. In one case Wendt found the labyrinth strongly hyperæmic. It must be borne in mind that the last-named part has rarely been investigated in cases of variola. These results are in accord with those gained by Dr. Wendt, of Leipsic.

Dr. Ogston has also contributed a case of rupture of the membrana tympani in a man who had been hung. The rupture is described as ragged, and running from the end of the handle of the hammer downwards. The edges were turned outwards; there was no blood, nor any other fluid in the middle ear.

Prof. Politzer, in a short paper, speaks again of "pedunculated bodies" found in the human middle ear, and first described by him. Later investigations have shown him that the two forms, round and triangular, which he heretofore found separate, may occur in the same individual, and also the same peculiar bodies may be found on the membrana tympani; but this is of rare occurrence.

From the same source we have a paper on "Vascular Alterations in the diseased lining membrane of the Middle Ear."

The venous blood-vessels of the mucous membrane of the cavity of the tympanum, in cases of inflammation with perforation, are especially discussed. Increase in number and size, and great tortuosity, characterize the original vessels; new vessels may also form, in which the walls are thickened and permeated by a granular exudation, and are also stained by pigment. The lymphatics also manifest changes in the form of *cul de sacs*, and lobular projections. The epithelium also appears infiltrated by a fine granular mass and small fat-globules.

In an article on emphysema produced by the introduction of air into the middle ear, Voltolini has demonstrated the

true cause of its occurrence. He says that after the introduction of a probe or bougie into the Eustachian tube, no air should be immediately forced in, because the mucous membrane has most likely been lacerated. He also discards entirely the use of the air-pump, or any means more powerful than the hand-balloon.

The causes of death in emphysema produced by the air-douche, is apparently due to pneumo-thorax. Voltolini proved this to be the cause of death in a dog, into whose naso-pharyngeal region he first introduced a catheter, then a wire, by which he wounded the mucous membrane of the parts near the opening of the Eustachian tube. By a powerful introduction of air he produced sudden death, and a post-mortem examination of the animal showed that air had entered the pleural sac and produced collapse of the lungs. There was no emphysema of the vocal cords nor of the larynx.

Several incisions in the membrana tympani, mostly in directions forming acute angles with the manubrium of the hammer, have been made by Gruber in cases of primary or chronic over-tension of the membrane with asserted success in removing tinnitus and in improving the hearing. The operation is simple and painless, and after all inflammatory symptoms have subsided, generally appears useful.

This method is but the application of an operation described and performed by Prof. Politzer some time ago in the Wiener med Zeitschr, 71, 20.

J. S. Prout has performed myringectomy upon a lady affected with progressive deafness and adhesions.

The knife was made expressly for the operation, "the blade of which, bent on the flat at an angle of forty-five degrees, is triangular in shape, about one and one half lines long, and three fourths of a line broad, sharp at the point, and cutting at both edges." Dr. Prout says: "In doing the operation I proposed to introduce the point through the membrana tympani, a little way from the adhesion, and by a circular sweep of the blade cut round the promontory, so

that I might then remove the piece of adherent membrane. Two days after the operation, the hearing-power for the voice was markedly improved. Three months after the operation the opening still persisted, and the hearing remained improved.

A. H. Buck has communicated the histories of several rare and interesting cases met with in his practice, among which we may name "hook-shaped manubrium mallei," "extravasation of blood into the tissues of the membrana tympani, produced by inflation of the middle ear, according to Politzer's method, and resulting in a perforation of the membrana tympani." A similar case reported by Gottstein (Archiv. für Ohrenheilkunde Bd. IV, p. 71), is referred to by the author. They are very rare.

The other cases are full of interest. "Gunshot-wound in the ear, — removal of the ball after a lapse of nearly ten years," shows how easily the presence of a foreign body in the ear may escape the eye of the hurried surgeon on the field of battle. Dr. Buck removed the ball very easily by means of forceps.

The "arterial hemorrhage from the ear after the removal of a polypoid growth," reminds us of a similar case reported by Moos.

Dr. Blake has given to the profession one of the most valuable papers, because it is statistical. It is from such papers as these that great deductions may be drawn, while the inductive means are being used and constantly employed.

Those parts of Dr. Blake's paper which treat of myringitis, its causes and treatment, are of special interest and worth.

The causes have been shown to be exposure to cold air, or sea-bathing, and the treatment consisted in "free scarification of the membrana tympani, from two to four cuts being made in each case, the points selected for incision being those of greatest prominence or greatest degree of congestion, care being taken not to cut through into the tympanum. Relief was obtained, as a rule, by the one scarification.

The next point of interest in this paper is treatment of the disease known as *otitis media catarrhalis chronica.* The treatment is similar to that of Gruber, and of Politzer, consisting in repeated myringotomy. Blake says the theoretical grounds on which this treatment was instituted, and the reasons for improvement, probably are the diminished resistance to passage of air to the middle ear through the Eustachian tube, the membrana tympani being perforated; and secondly, the irritation consequent upon the repeated incisions resulting in a diminution of the thickening of the membrana tympani.

"In connection with cases of perforation of the membrana tympani, a series of experiments was instituted, with regard to a perception of high musical notes, a summary of which has already been published (Trans. of the American Otological Society, 1872)." The observations on this point are filled with interest, and must also aid in forming a diagnosis of ear disease; for Blake has shown that a concave membrana tympani perceives a higher tone than a less concave one. The same power was developed by voluntary contraction of the tensor tympani muscle. The increased perception of high tones during the passage of the electric current, the cathode being applied in front of the ear, seems to indicate a contraction of the tensor tympani muscle.

Bonnafont, at a meeting of the Academie de Medicine, held July 16th, 1872, demonstrated that the phenomena of taste, etc., produced by irritation of the chorda tympani, and considered by Duchesne and Philipeaux, to be of importance in the diagnosis of the degree of sensibility of the auditory nerve, possessed no real clinical value, and can never be used to determine the degree of sensibility of the auditory nerve, since there is no anatomical connection between the two.

Vulpian has continued his experiments upon the chorda tympani which have had for their object the decision of the question, whether the chorda tympani is to be considered a

centrifugal or a mixed nerve, containing more or less centripetal fibres. The result of the experiments shows that the nerve contains centripetal fibres, which serve as a means of communication for excito-motory irritation, destined to act on the sublingual gland by reflex action. It contains, then, both centripetal and centrifugal fibres, which convey reflex excitation to the gland.

Another series of experiments, confirmed by Prévost of Geneva, shows that part of the chorda tympani accompanies the lingual nerve in its peripheric distribution, furnishing branches to all the terminal filaments of the latter.

We may therefore conclude that the chorda tympani has some influence on the tongue. By experiments, Vulpian showed this to be as follows: The fibres of the chorda tympani which accompany the lingual nerve in its distribution to the tongue, have the same influence on the vessels of that organ, *i. e.* direct dilating influence which the fibres of the chorda tympani possess over the vessels of the submaxillary gland, as already proved by Cl. Bernard.

Vulpian concluded his paper by remarking that the chorda tympani has little sensibility.

Prof. Lucæ reiterates his conviction that certain bodies found in the membranous semicircular canals of man are of a pathological nature, and are peculiar to the adult human being. These are never found in the new-born child, but are produced in some cases by local disturbance, whereas in other cases they are the results of a general systemic disease.

To these bodies Lucæ still applies the name of corpora amylacea, since their starchy nature is said to be proven by the characteristic reaction manifested by them in presence of iodine.

These products, or so-called corpora amylacea, are found in cases of gray degeneration of the spinal cord, typhus, tumor of the brain, tuberculosis, morbus Brightii, peritonitis, chronic ulcer of the stomach, and in cases where a disease of the ear has been present up to the time of death, — as, for example, otitis media. These bodies are not found in

the lower mammals, birds, fishes, or amphibia, by any observer, which is considered additional proof by Lucæ of their pathological nature.

So far as the occurrence of these bodies in the diseases mentioned above is concerned, it may be said, as Rüdinger has already suggested, that it is rather *past hoc* than *propter hoc;* for it is just such diseases which supply material to the anatomist for his investigations; and hence, if they are normally present, these subjects in common with all others should present examples of the so-called corpora amylacea.

Voltolini calls attention to the frequency of a disease among children which he denominates otitis labyrinthica. He describes it as being as frequent and specific as croup. Although the vast majority of these cases are called meningitis cerebro-spinalis, they are really well-marked cases of another disease, viz. otitis labyrinthica, and lack the important features of the above-mentioned fatal malady. Sudden vomiting, with no premonitory symptoms, ushers in the disease, which is attended by no convulsions, paralysis, nor opisthotonos, the mind remains clear, and there is no pain in the head.

The patient complains usually of great subjective roaring in the *head.* This may remit. The head in some cases appears too heavy for the little patient, and it falls over on the shoulders. There is no derangement of the bowels or urine. All the marked symptoms occur within three or four days, and then the patient *recovers entirely*, except the loss of hearing, which is generally total and permanent. In some cases it seems that the child hears music, for the parents say that when the music begins the child begins to dance, — a statement which must generally be accepted with caution. Voltolini has seen only one case of this disease in an adult.

Prof. Rüdinger has contributed an exhaustive paper on the membranous labyrinth, in the last part of Stricker's Hand-Book of Physiology. This paper is divided into six parts. 1. Topographico-histological. 2. Wall of the labyrinth. 3. The vessels of the membranous labyrinth. 4.

Nerves and epithelium of the ampullæ and sacculi. 5. Otoliths. 6. The oval window and its union with the stapes.

The membranous labyrinth is now considered an important part of the perceptive acoustic apparatus. Its topography and histology vary in the different classes of mammals, but in almost all vertebrates the membranous labyrinth is that part of the acoustic apparatus more or less completely closed by a cartilaginous or osseous capsule, with the shape of which it closely corresponds.

The most important statement occurring in the first part of the paper, is, that the sacculus longus, with the ampullae and semicircular canals, as well as the sacculus rotundus, are in direct contact with the osseous or cartilaginous capsule containing them, and that they do not float, as heretofore supposed, suspended in the perilymph.

The relations between the various parts of the labyrinth are seen in the embryo, in which sections through the petrous bone, at different stages of development, show the interior of the vestibule and semicircular canals to be filled with a gelatinous tissue, which finally assumes a fibrous nature at the walls where at last the various parts of the labyrinth adhere. The periosteum lining the bony labyrinth is a moderately thick layer of connective tissue, containing fine elastic fibres. It is very adherent to the wall, which it covers, and its surface in the semicircular canals is somewhat uneven. It is filled with rather large cells, which become more numerous and less regularly arranged as we approach the free surface. Rüdinger agrees with Henle and Hasse, that this is not epithelium, but a mass of cells belonging to the periosteum. He found the calcareous bodies, mentioned by Kölliker and Henle, in the periosteum of the canals in some individuals, but not invariably.

Of the sacculi, the utriculus is more closely connected to the inner wall of the vestibule than the sacculus rotundus. The two sacculi occupy two thirds of the cavity of the vestibule. The utriculus extends farther outwards towards the tympanum, but neither of them touches the side of the vestibule which receives the base of the stapes.

The membranous semicircular canals are fastened to the convex side of the osseous semicircular canals by means of stout connective tissue-fibres, which are called by the author ligamenta labyrinthi canaliculorum et sacculorum. These constitute the true support of the membranous semicircular canals.

Sometimes there are two or more of these connective tissue stays, so arranged as to simulate under the microscope transverse sections of small canals.

But to these, Rüdinger assigns no special morphological or physiological importance, and they must be regarded simply as part of the supporting apparatus of the membranous labyrinth.

Another set of connective tissue-fibres, which pass from the periosteum to the free surface of the labyrinth-wall, are for the purpose of supporting the blood-vessels as well as furnishing points of fixation for the free wall of the membranous labyrinth. In all the apes and lower mammals the labyrinth is similarly fixed.

In the rat, the major portion of the osseous semicircular canal is filled with a dense net-work of connective tissue, containing pigment-cells, closely imbedded in which lies the eccentric membranous semicircular canal, thus greatly differing from man. The sacculi are fixed, however, just as in man.

In birds, the position of the membranous semicircular canal, according to both Hasse and Rüdinger, is also eccentric. In birds, the ampullae are in contact on all sides with the periosteum of the osseous canal. In the rat, birds, fishes, and short-tailed batrachians, there is no evidence that the cavity which encloses the free surfaces of the membranous semicircular canals and the utriculus, is lined by serous membrane.

In fishes the membranous semicircular canals are fastened to the wall of the relatively wide bony canal, which is filled with a connective tissue net-work containing a series of cavities filled with mucus.

In regard to the labyrinth of the frog, Rüdinger cannot accept the idea of Hasse, that in it we find a serous membrane. In the semicircular canals of the fully developed frog, we find gelatinous tissue similar to that found in the corresponding parts of the human embryo.

The second part of this paper of Prof. Rüdinger is devoted to the wall of the labyrinth. This has an equal thickness, being 0,016-mm. at the point where it touches the periosteum, and thickest at the point of junction with the *Ligamenta labyrinthi canaliculorum.* We can distinguish four layers composing the wall.

1. One of connective tissue.
2. Hyaline tunica propria.
3. Papilliform prominences; and
4. The epithelium.

The external layer possesses all the qualities of connective tissue with numerous cells; there is, however, no pavement-epithelium on the outer surface of the membranous canal. When the entire membranous semicircular canals, removed from their connection with the periosteum and ligaments, are subjected to examination, we find another net-work of fibres, closely resembling nerves and ganglia. Prof. Rüdinger does not say whether these are nervous elements or not. It would be, however, adds the author, of deepest interest were it so, since the existence of nerves in the membranous semicircular canals is as yet doubtful.

The tunica propria is likewise of unequal thickness in the semicircular canals; but in the utriculus it is of uniform as well as great tenuity.

The papilliform prominences, on the inner surface of the tunica propria, are considered by Rüdinger as normal structures in the adult human being.

They are so constant in their occurrence that their absence and *not their presence* is to be considered pathological. They are confined to certain parts of the wall of the canal, are varied in their size and form, and pass imperceptibly into

the tunica propria of which they must be considered a part. They attain their greatest size at the point of insertion of the ligamenta labyrinthi; they are not found on that portion of the tunica propria corresponding to that part of the canal in contact with the bony wall, and are but slightly developed on the free side of the membranous canal.

The papillæ are covered with pavement-epithelium, which is easily detached; and hence the assertion on the part of some observers, that epithelium does not exist at this point. These bodies are not found in the sacculi, nor at that part of the semicircular canals where the latter pass into the utriculus. Although these bodies may not be found in the new-born child, and are considered pathological products by Lucæ and Voltolini, Rüdinger says he has never failed to find them in the adult human being.

Lucæ urges the absence of epithelium, and the reaction between these bodies and iodine, as proof of their starchy nature.

Rüdinger says that epithelium can always be shown to be present with these bodies by the application of the proper tests; and so far as iodine is concerned, that gives the peculiar reaction alluded to in common with the tunica propria and many other tissues in which the presence of starch has *never* been proven.

In conclusion, Rüdinger says their round form can never be adduced as a proof of their amyloid nature, and if the inner surface of the membranous canals possesses a secerning nature, these bodies will supply a larger surface demanded by such a function. These papilliform bodies are not found in the lower mammals.

The fourth part of the paper by Rüdinger consists of a description of the nerves and epitheluim of the ampullæ and sacculi.

As far as the distribution of the acoustic nerve can be traced in the sacculi and ampullæ, we find, on the inner surface of these organs, a constant and peculiar yellowish

epithelium provided with hairs, or cilia. The *crista acustica* is the reduplication and projection of the *tunica propria* extending into the cavity of the ampullæ.

The similar formation in the sacculi is denominated the *macula acustica.* Both names are suggestions of Max Schultze.

Every branch of the acoustic nerve which goes to an ampulla, after dividing into two flat bundles supplied with ganglion-cells, sinks into the furrow which is visible from without, and then passes through the *tunica propria* in order to reach the epithelium of the *crista acustica.*

The thickness of the layer of nerve-epithelium in man stands between that of birds, which is the thinnest, and that of fishes. In connection with this layer of epithelium are the stiff cilia, called "acoustic hairs" (Hörhaare), first described by M. Schultze.

In the sacculi, the layer of nerve-epithelium is, on the average, much thinner.

In connection with the acoustic hairs, Rüdinger has described "pale, structureless bodies which occur on the crista acustica and planum semilunare, forming a kind of gelatinous covering for the epithelium and acoustic hairs. These are best seen in fishes of the cyprinoid variety.

The aqueductus vestibuli and canalis reuniens are next considered. The first is regarded by Rüdinger as designed for the reception of veins, as already described by Hyrtl.

The canalis reuniens was first described by Hensen. It is the connecting link between the sacculus rotundus and ductus cochlearis. The otoliths vary in size and shape in different animals. In reptiles and ostracians they attain their largest and handsomest shapes. Some authors claim to have found otoliths, not only in the endolymph of the labyrinth, but also in the serum of the cochlea. Rüdinger is not decided on this point.

In part IV of Stricker's Manual of Physiology, we have Waldeyer's work on the acoustic nerve and the cochlea;

not only in German, but in two English translations, have the members of the profession been made acquainted with the facts contained in this exhaustive paper. It will, however, be fitting to give a short sketch of his labors in this report.

The paper is divided into heads as follows: Comparative Anatomy and History of Development. Capsule of the Cochlea and Membrana Propria of the Ductus Cochlearis. Epithelial Lining of the Ductus Cochlearis. Corti's Organ. The Acoustic Nerve and its Relations to the Organ of Corti. Cochlea of Birds and Amphibians. Comparative Anatomy and Physiology. Corti's Organ and the Retina. Controverted Points. History. Statistical Tables.

The author opens his paper by saying: The cochlea is an attribute of the higher vertebrate classes. The sacculus and ductus cochlearis belong to the cochlea, while the utriculus belongs to the semicircular canals, and these together form the so-called semicircular apparatus (Bogenapparat). The first trace of a ductus cochlearis is found in the cysticula of fishes, as described by Hasse and Breschet.

In amphibians we can distinguish several divisions of the sacculus as forming parts of the cochlea; these, however, are only several thicker portions of the wall of the sacculus, which are provided with special terminal nerve-filaments, as shown by Deiters and Hasse. A still further-developed cochlea is seen in reptiles and birds, and in them we find the first manifestations of a spiral-shaped cochlea, united to the sacculus by the canalis reuniens of Hensen. The canalis reuniens and the ductus cochlearis are lined with a short cylindrical epithelium, but receive no nerve-fibres from the acoustic nerve. It is now for the first time in the history of its development that the cochlea deserves its name, for it is now found wound spirally around the modiolus. The number of the turns in the spiral varies in different species of vertebrates from one half to five turns. It is lowest in the planorbis of the cetaceans, and highest in the Clausilia, or guinea-pig.

Then follows a description of the human cochlea, with its division into scala vestibuli, scala tympani, and the triangular-shaped ductus cochlearis lying between them.

The latter is bounded above by the membrane of Reissner, below, or towards the tympanum, by the membrana basilaris, outwards by a layer of connective tissue rich in vessels. Thus its triangular shape is defined.

Traces of the cochlea are seen in the embryo eight to ten weeks old, near that part which is finally the pars petrosa of the temporal bone. We can then distinguish three varieties of tissue; most external is a cartilaginous mass connected at that time with the cartilaginous base of the skull. Enclosed in this mass is a collection of embryonal mucous tissue, within which, again, is embedded the epithelial labyrinth-vesicle. From the latter, which at last becomes the sacculus, a hollow sprout lined with epithelium, grows before the eighth week, and pushing into the mucous tissue, is forced by the surrounding cartilage to curl itself up into a spiral shape.

At one point the cartilaginous capsule is not closed, and here the cochlear branch of the nervus acusticus enters. In the human embryo of three months, the hollow offshoot manifests the features of the future ductus cochlearis, with all its windings. In embryos of four months, the scalæ, as well as their contents, begin to form.

The next point considered relates to the capsule of the cochlea and the membrana propria of the ductus cochlearis. The bony portion of the capsule is divided into a compact inner layer (tabula vitrea), and the more porous modiolus and lamina spiralis. In the latter we find the canalis ganglionaris, which conceals the spiral ganglion of the acoustic nerve.

The inner surface of the periosteum is covered with a layer of simple, large, flat, nucleated cells, similar to those found on the surface of serous membranes.

The author furthermore states that the investigations of

Schwalbe have proven that the scalæ cochleæ are connected with the arachnoideal cavity of the brain.

The membrane of the round window is composed of two layers, one of mucous membrane from the tympanum, and the other of periosteum from the cochlea. The next points considered under this division of the treatise are, the aqueductus cochlea, membrana Reissneri, and the ligamentum spirale.

The membrane of Reissner receives the most attention, and is said to consist of a thin, connective-tissue basement-lamella, rich in vessels, possessing on its vestibular side large-celled, serous epithelium, and on its tympanal side a single layer of regularly-arranged cubic epithelial cells. The sulcus spiralis externus, crista spiralis, the "acoustic teeth" (Gehörzähne of Huschke) are next considered. The latter are merely projections in the osteogenous substance of the crista spiralis. This subdivision closes with a further consideration of the membrana basilaris and its appearance after the removal of Corti's organ.

The author says: I dare not say whether or not the membrana basilaris possesses a high grade of elasticity; in any event it manifests no great disposition to curl up at its edges; neither is it difficult to pick it apart. The best transverse sections teach us that the membrane is always smooth and tightly stretched between its two points of attachment.

The next portion treats of the epithelial elements of the ductus cochlearis and its masterpiece, the organ of Corti.

The organ of Corti and its important parts, the arches of Corti, the inner and outer series of "hair cells" (Haarzellen), the membrana tectoria, and the membrana reticularis, are considered in turn.

The labors of Hensen, Deiters, Max Schultze, and Bœtcher are constantly alluded to and often quoted *in extenso*. The so-called Corti's cells are acknowledged by the author to belong to the structures in the cochlea most difficult to examine. He adheres to the description already given by Gottstein (Innsbrucker Naturforscher-Versammlung, 1869).

The so-called hair-cells (Haarzellen) are evidently objects of the greatest interest to the writer, and to them he has turned his most observant attention.

He says in conclusion: If we leave the various peculiarities of the inner hair-cells out of consideration, the apparently complicated structure of Corti's organ reveals really a simple plan. It may be thus described: Several rows of cylinder-cells are arranged behind each other in a regular order upon a broad zone of the spiral membrane, and are kept in their position by two membranous boundaries, the lamina reticularis, and the striped layer of the membrana basilaris. The inner hair-cells differ from the outer hair-cells in not being double cells, and are also less numerous than the outer hair-cells. The number of the inner arches is also less than that of the outer ones. These cells, with Corti's organ, are the exclusive peculiarity of the cochlea of man and mammals. The hair-cells are of great importance in connection with the terminal portions of the acoustic nerve, for to these cells the nerve-fibres are distributed.

The next division refers to the acoustic nerve and its relations to Corti's organ. The author adheres to the description of the origin of this nerve as given by Stieda. It arises by two roots from the medulla oblongata. The fibres of the acoustic nerve are distributed to the cochlea by means of the ramus cochlearis. To this branch of the acoustic nerve the author has devoted his attention. The ultimate fibres as they reach the cochlea are distributed to the inner and outer hair-cells, and are hence called the inner and outer terminal nerve-fibres.

Their name indicates their manner of distribution. Gottstein was the first one to trace the outer fibres to their ultimate distribution to the inner row of the outer hair-cells. Waldeyer is unable to say whether the outer rows receive filaments of nerves or not, but is inclined to the opinion that they do, since we often see several nerve-fibres pass together between the pillars of the arches, and it is fair to presume that they are on their way to the remoter hair-cells.

In alluding to the spiral tracts of the cochlea, the author says they belong to the most delicate structures known to the histologist, and they are probably of nervous origin.

They were first described by Max Schultze, and although their origin is involved in obscurity, the author inclines to the view that they are among the most important elements of the cochlea.

The simple structures of the cochlea of birds is next considered, in which the "dentate cells" (Zahnzellen) of Hasse are alluded to, and that author's opinion that these cells contribute to the formation of the membrana tectoria is accepted by Waldeyer.

The "Stäbchen-Zellen" of Deiters, Hasse, and Leydig are not accepted by Waldeyer. He calls them ciliate cells (Haarzellen). Only in pigeons has Waldeyer found nerve-fibres in connection with these ciliate cells (Haarzellen), while Hasse has found them in fishes as well as in birds; the latter, also, claims a similar structure for the cochlea of frogs. Under the head of "Remarks on the Comparative Anatomy and Physiology of these Parts," the author says the anatomical facts point with certainty to the great fact that the (Haarzellen) ciliate cells are the most important part of the cochlear apparatus. We must also bear in mind that the ciliate cells of amphibious reptiles and birds resemble more closely the inner ciliate cells of mammals, in which, in the structures of the Corti's arches and outer ciliate cells, we meet something new. Corti's organ must be considered as a supporting apparatus for the ciliate cells.

Waldeyer considers the functions of the membrana tectoria and the otoliths as a muffling, or damper-apparatus. The final part of this paper is devoted to a comparison between Corti's organ and the retina.

I. A. Nussbaumer, a medical student in Vienna, has communicated some very interesting facts relating to subjective perceptions of color produced in himself by objective perception of sound. He states that his brother has the

same peculiarity; but the same objective sound produces different subjective impressions of color in each.

The note "small e" on the piano produces in the former the color of dark yellow; in the latter, the subjective impression of color is dark-blue. There are some colors which no note ever calls up; blue and yellow, brown and violet, are the colors most frequently produced. There is no red nor green, nor perfect black and white, in any notes. Nussbaumer, however, perceived *green* upon hearing suddenly a peculiar noise. Colors are also perceived by him in dreams if noises occur.

The author at last endeavored to represent the picture of the fundamental note as a mixture of single pictures, corresponding to the separate partial tones, and he was in a measure successful.

James Hinton has contributed a paper on Ménière's disease, containing an account of nine cases of this, as yet, obscure affection. In one case a perturbed perception of musical notes was a marked symptom, "g" of the third octave being heard twelve notes lower, or as "c" of the octave below. The note most distinctly heard was "g^{iv}."

In this paper the author states that the "disease which most frequently produces permanent abolition of hearing, without apparent affection of the tympanum, is mumps. Unfortunately, dissection has thrown little light upon its pathology."

"For the most part, the tympanum in these cases appears perfectly healthy, and the loss of hearing is the only symptom at all connected with the ear. Then follow two cases, reported by the author, in which an affection of the middle ear appears to have been present with the mumps. "The prognosis, as regards the recovery of the hearing, is in the last degree unfavorable, and this seems to be the experience of all who have written on the subject. But there seem to be some other cases which suggest that these affections may exist in various degrees of intensity, and that probably the cases which have hitherto attracted attention are the

residuum, as it were, of a much larger number, less severe, and escaping observation through taking a favorable course."

There are several interesting conclusions to be drawn from the statements made in this interesting paper.

1. It appears that in some instances the hearing power is worse at the time of the paroxysms of giddiness and vomiting. In others, the hearing power is at once impaired, and remains so, or is observed gradually to improve.

2. All the marked and serious symptoms may be present, and yet recovery finally occur.

3. Tinnitus in these cases may be due to muscular spasm, either in the tensor tympani, or, as the author suggests, in the stapedius muscle. This latter statement may be very attractively connected with a very interesting and scientific paper by Dr. Brunner, of Zurich, which I shall allude to now.

Brunner has contributed an interesting and analytical treatise on the symptoms produced in the auditory apparatus, by the discharge of fire-arms in its vicinity, and upon tinnitus aurium in general.

He states that there is a *constant* aërial communication between the tympanum and the pharynx, independent of the act of deglutition, by means of the so-called safety-tube (Sicherheitsröhre) of Rüdinger. This allows of a ready recoil of the membrana tympani in cases of sudden concussion. The feeling of fulness experienced by the discharge of fire-arms near the ear, as well as the subjective noises, are produced, according to his views, by a reflex spasm of the tensor tympani, accompanied by an excess of irritation of the acoustic nerve. The pitch of the notes heard in tinnitus aurium is high in the scale, and is due to the increased tension of the membrana tympani and its consequently greater susceptibility to respond to high notes; or, as Hinton calls them, "harmonics usually inaudible to the ear." They may be considered as emanating from objective sources, according to Brunner; but Hinton has suggested no explanation on account of this increased susceptibility for high notes; the

high partial tones are heard better than the lower fundamental note, both of an instrument and the voice.

A most interesting addition to the pathology of the acoustic nerve has been given by Prof. Bœtcher, of Dorpat. The paper treats of fibro-sarcoma of the acoustic nerve, and the author has shown that, whereas tumors of this nerve have usually been classified under the head of neuromata of the acoustic nerve, in this morbid growth, the features most apparent were not of a nature to indicate a nervous origin, but the mass was distinctly fibrous in its character.

The author says: "The definite outlines of the axis-cylinders were entirely wanting, the presence of which alone would justify us in calling it a neuroma."

Dr. Blake gives the following summary of conditions under which the constant electric current may be used as a means of diagnosis. They are: chronic catarrh of the middle ear, both of long and short duration; deafness, occurring during pregnancy, child-bed, at puberty, from mental disturbance, bodily exhaustion, and accident; deaf-mutism, acquired or congenital. In many cases it is not possible to establish a formula for the reaction of the auditory nerve, and in many cases no formula whatever can be obtained, although the necessary conditions with regard to a successful application are fulfilled. Blake then proposes to supplement the practical value of Brenner's discovery, by testing the effects the current has upon the perceptive power of the acoustic nerve. In such cases, where Brenner's plan has failed to be of practical value, Blake has suggested a plan of testing whereby he has found that the perceptions for high musical tones increased from three to five thousand vibrations per second above the highest limit of hearing before the application of the current. This increase in perception is continued during the passage of the current, and for a short time after opening the cathode, but is speedily diminished by a reversal of the current and the application of the anode. Another conclusion, drawn by Blake from his experiments on this topic, is the following: When the cathode is applied in front of

the ear, as in one of his experiments, we find that the passage of the galvanic current increases not only the limit of perception of musical tones, but also the intensity of perception, the degree of increase in intensity of perception being a measure of the degree in which the auditory nerve responds to the stimulus.

A still further conclusion, drawn by Dr. Blake from his experiments, is the following: —

It will be found as a rule, that the current which diminishes the tinnitus aurium increases the hearing, and the current which increases the tinnitus, diminishes the hearing. In cases where the tinnitus is diminished without increase of hearing, this effect is usually produced by the use of the anode, the cathode increasing the tinnitus, without a corre sponding increase of hearing. When the hearing is increased, together with an increase of the tinnitus, this result is usually obtained with the use of the cathode.

If the improvement in hearing, and an attendant diminution of tinnitus, cannot be effected by the use of the same pole, Blake advises the use of that pole which improves the hearing, although it increase the tinnitus, for the latter will usually be but temporary.

Blake's modified Kœnig's rods have been used in these experiments for testing the increase in the perceptive power of the auditory nerve.

In ordinary practice the author advises the use of a battery without the intervention of Rheostat, if the latter instrument is not at hand, applying one electrode before the ear and the other in the hand of the opposite side of the patient.

W. B. Neftel has investigated more closely the abnormal galvanic reaction of the acoustic nerve in chlorosis and Bright's disease.

The cause of the abnormal reaction in the acoustic nerve of chlorotics is due to a tendency towards a rupture of the blood-vessels in the auditory apparatus. An abnormal reaction of the acoustic nerve has been also found in two cases of constitutional syphilis, with affections of the brain. No

reasons are assigned by the author for this abnormal reaction of the acoustic nerve in constitutional syphilis; but in Bright's disease, he thinks it may be due to hemorrhages into the labyrinth.

From Brussels, we have a work containing one hundred pages on Tinnitus Aurium, by Delstanche, fils, divided into chapters as follows: Introduction, Etiology, — divided into six subdivisions, — Diagnosis and Treatment. Then follow some conclusions.

The chapter on treatment of this distressing symptom is very copious in its data, containing nearly all the views on the subject.

The work claims no great amount of originality, but surely is an excellent compendium of all that is known on this subject.

Prof. Moos has written a very interesting paper upon the "significance of the higher musical notes, based upon pathological observations." The paper contains the histories of seven cases which furnish data for the conclusions drawn by the author. Among these cases there are three of Ménière's disease, and one case of each of the following diseases: cerebro-spinal meningitis, hemorrhage into the labyrinth, meningitis, and concussion occurring in a man afflicted with rheumatic and syphilitic poison. Moos concludes his paper with the following words: "In considering the facts observed in the first four cases, we find that, upon the whole, they correspond with our knowledge of the significance of the higher musical tones in relation to the perception of speech. . . . The higher tones appear of greater importance for the understanding of speech than the lower ones. This observation corresponds with the physiological facts as regards the pitch of the single vowels and consonants, of which the human speech is composed. (Helmholtz and Wolf.) Aside from their diagnostic value, the cases reported in this paper are of interest to the aurist in regard to prognosis. In many cases of so-called nervous affections of the ear, the question as to whether the patient perceives

the higher musical tones distinctly, faintly, or not at all, may furnish us with a clew as to the probable degree of recovery of hearing."

Your committee would state, in this connection, that a case of deafness for low notes has recently come under his notice. The young lady who was the patient was not at all deaf for the sounds of the human voice, but was made aware of deafness for *low* notes by a curious occurrence. She was walking in the field with her father when a thunder-storm was approaching. Her father could hear the thunder, but she was unable to hear it. She also failed to distinguish the bass notes of the organ.

J. J. Müller, in a paper on the notes perceived in tinnitus aurium, makes the following conclusions: In general a compound perception will arise from the fundamental note, and the overtones of a simple objective vibration, although the former may not be recognized as such.

The author therefore endeavors to find an evident analogy between this fact and the theory of the distinction of colors, as explained by Young and Helmholtz, in so far as according to the latter, each mode of æthereal vibration excites a perception of those fundamental colors.

Clarke and Amory, in their valuable work on the "Physiological and Therapeutical action of Bromide of Potassium and some kindred Salts," have shown that the hearing is unaffected by bromides.

The subject of deaf-mutism and the education of the deaf and dumb by means of lip-reading and articulate speech, has claimed the attention of aurists, both in England and America, during the past year. Drs. Dalby,[1] of London, Turnbull,[2] and Burnett,[3] of Philadelphia, have written papers calling attention to this very important topic.

We record with pleasure the regular appearance of the

---

[1] Education of the deaf and dumb by means of lip-reading and articulation. London, 1872.

[2] Phila. Med. and Surgical Reporter. December 1872.

[3] Phila. Medical Times. Sept. 2, 1872.

"Monatsschrift für Ohrenheilkunde," in Berlin, the "Archiv für Ohrenheilkunde," in Leipzig, and the "Archives of Ophthalmology and Otology," published every six months, simultaneously in Carlsruhe and New York.

In the recent issue of the last-mentioned periodical, Dr. Knapp has described an ingenious operation for cleft lobule of the auricle, as well as a new method of recording the hearing power.

The latter is a modification of one already devised and described by Dr. Prout (Boston Med. and Surg. Journal, Febuary 1872).

These few sketches of the contributions to Otology, gathered from the various branches of science, relating to our specialty, serve to demonstrate the growing importance of the subject, as well as the frequency of ear diseases and the many channels which lead to a rational and successful treatment of them.

BIBLIOGRAPHICAL RECORD.

JULY, 1872, TO JULY, 1873.

Ashhurst, Samuel. A case of Necrosis of the cranial bones, in connection with disease of the mastoid cells. Phila. Med. Times, April 26, 1873.

Blake, Clarence J. Statistical report of 1652 cases of disease of the ear. Archives of Oph. and Otol. Vol. III. No. 1.

Blake, Clarence J. Summary of observations on the effect of the galvanic current upon the auditory nerve. Archives of Scientific and Practical Medicine. No. IV. 1873.

Bœtcher, A. Case of fibro-sarcoma of the auditory nerve. Archives of Oph and Otol. Vol. III No. 1.

Brunner, Gustav. Kritische Bemerkungen. M. f. O. No. 2. 1873.

Bœtcher, A. Ueber die Symptome die der Knall von Schiessgewehren im Ohr. hervorruft. M. f. O. No. 4. 1873.

Bonnafont. Relations of the chorda tympani to the auditory nerves. Boston Med. and Surg. Journal, Oct 3, 1872. (Quoted from the "Mouvement Medical," Aug. 10, 1872.)

Buck, A. H. Diseases of the mastoid process: their diagnosis, pathology and treatment. Archives of Oph. and Otol. Vol III. No. 1. 1873.

Buck, A. H. A few unusual cases met with in ear-practice. N. York Med. Record, Dec. 16, 1872.

Brown-Séquard. A lecture "On the origin and signification of the symptoms of Brain Disease." University of Pennsylvania, Oct. 10th, 1872.

Burnett, C. H. Clinical notes "On Diseases of the Ear," etc. Philadelphia Med. Times, Oct. 5th, 1872.

Burnett, C. H. A contribution to the comparative distribution of blood vessels in the membrana tympani. Am. Journal of Med. Sciences, January, 1873.

Burnett, C. H. Lip-reading and articulation in the education of the Deaf and Dumb. Philadelphia Med. Times, Sept. 2, 1872.

Clarke and Amory. Physiological and therapeutical action of Bromide of Potassium. Boston, 1872.

Cassalls, Jas. P. On the treatment of exanthemal catarrh of the tympanum. Glasgow Med. Journal, Aug., 1872.

Clarke, Edw'd H. A case of disease of the ear, followed by abscess of the brain. Archives of Scientific and Prac. Med., No. 1, Vol 1.

Dessau, S. Henry. Abscess of the mastoid cells. Spontaneous evacuation, followed by caries. N. Y. Med. Journal, May, 1873

Dalby, W. B. Traumatic rupture of the tympanic membrane. The Lancet, June 14, 1873.

Dalby, W. B. On diseases and injuries of the ear. Crown: 8vo (in press).

Dalby, W. B. Education of the Deaf and Dumb by means of lip-reading and articulations. London, 1872.

De Rossi. Ein einfaches binoculäres Otoscop. Monatsschrift für Ohrenheilkunde. Jahrg. v. No. 7.

Delstanche, fils Charles. Etude sur le bourdonnement de l'oreille. Bruxelles et Paris. 1872.

Erhard, J. Sitzung Berliner Mediz. Gesellschaft. Juli 5, 1872.

Erhard, J. Skizze einer physikalischen Otiatrie. Berlin. Klin. Wochenschrift. 1872.

Eysell, Adolph. Casuistische Mittheilung aus der Policlinik für Ohrenkranke zu Halle a. S. Archiv f. O. N. F. 1 Band.

Fox, C. B. Quoted in Dr. Dobell's Lectures on Winter Cough, etc. London. 1872.

Frank, Carl. Tenotomie des M. tensor tympani. Monatsschrift für Ohrenheilkunde. Jahrg. VI. No. 7.

Falk, Fr. Zur statistik der Taubstummen. Archiv für Psychiatrie, 1862. S. 407.

Fürstner. Zur Streitfrage über das Othaematom. Archiv für Psychiatrie III. 2. 1872.

Gruber, J. Bemerkungen über die Weber, sche Nasendouche, etc. Monatsschr. f. Ohrenheilkunde. Jahrg. VI. No. 8

Gruber, J. Ueber die Wahl der Einstichstelle am Trommelfelle bei der Durchschneidung der Sehne des Trommelfellspanners. M. f. O. No. 4. 1873.

Gruber, J. Die mehrfache Durchschneidung des Trommelfells als Heilmittel gegen primäre oder mit Trübung einhergehende übermässige Spannung desselben. Allg. Wiener med. Zeitung. Jan. 7, 14, 21. 1873.

Green, J. Orne. Report on Otology. Boston Med. and Surg. Journal. Oct. 3 and 10. 1872.

Harlan, G. C. A fatal case of purulent aural catarrh. Philadelphia Med. Times. Nov. 16, 1872.

Hinton, James. Labyrinthine Vertigo, sometimes called Ménière's Disease. Guy's Hospital Reports. 1873.

Hasse, Dr. C. Die vergleichende Morphologie und Histologie des häutigen Gehörorgans der Wirbelthiere nebst Bemerkungen zur vergleichenden Physiologie. 2 Tafeln. Leipzig, 1873.

Jacobi. Behandlungsresultate bei complicirten Otorrhœn, gewonnen mit Hilfe der caustischen, resp. galvano-caustischen Methoden. Archive f. Ohrenheilkunde. VI.

Knapp, H. Systematic method of testing and recording the acuteness of hearing. Archives of Oph. and Otol. Vol. III. No. 1.

Knapp, H. A method of operating for cleft lobule of the ear. Archives of Oph. and Otol. Vol. III. No. 1.

Kramer, W. Die Ohrenheilkunde der letzten 50 Jahre. Berlin, 1873.

Lucæ, A. Ueber locale Anwendung des Chloral-hydrats beim sogenannten trockenen Mittelohrcatarrh. Berlin. Klin. Wochenschr. No. 41. 1872.

Lucæ, A. Ueber eigenthümliche in den haütigen halbcirkelförmigen Kanälen des menschlichen Ohres vorkommende Gebilde. Virchow's Archiv, Band 54. Heft. 1.

Lucæ, A. Ueber eine Erweiterung des Helmholtzschen Ohrmodells nebst einem Beitrage zur Physiologie des Gehörorgans. Archiv für Ohrenheilkunde, neue Folge. B. I. H. I. 1873.

Levi, D. M. Maladies de l'Oreille. Paris. Adrien Delahaye. 1872.

Moos, S. Minor Otol. communications. Archives Oph. and Otol. Vol. III. No. 1.

Moos, S. Pathological observations on the Physiological significance of the higher musical notes. Archives of O. and O. Vol. III. No. 1.

Magnus, A. Ueber den Nasenrachenraum, eine Studie an einem Lebenden gemacht. Archiv f. O. B vi.

Neftel, W. B. Abnormal reaction of the acoustic nerve in Chlorosis and Bright's disease. Arch. of Scientific and Prac. Med. Vol. I. No. 1.

Nussbaumer, J. A. Ueber subjective Farbenempfindungen, die durch objective Gehörempfindung erzeugt werden. Wiener med. Wochenschr. 1873. 1, 2, 3.

Ogston. Der Zustand des Gehörorgans bei Variola. Archiv f. O. B. VI.

Ogston. Ruptur des Trommellfells bei einem Erhängten. Archiv f. O. B. VI.

Politzer, Adam. Ueber die Anwendung des Trommelhöhlen—Catheters. Wiener Med. Wochenschr. Nos. 9, 10, 11. 1873.

Politzer, Adam. Ueber Trommelfellnarben. Wiener med. Wochenschr.

Politzer, A. 10 Wandtafeln zur Anatomie des Gehörorgans. Wien. 1873.

Politzer, A. Ueber Trommelfellrupturen mit besonderer Rücksicht auf die forensische Praxis. Wiener Med. Wochenschr. No. 35 u. 36. 1872.

Politzer A. Zur microscopischen Anatomie des Mittelohres. Archiv für Ohrenheilkunde, neue Folge. Band I. Heft 1. 1873.

Politzer, A. Studien über Gefässveränderungen in der erkrankten Mittelohrauskleidung. Archiv f. Ohrenheilkunde. N. F. B. I. H. I. 1873.

Politzer, Dr. E. Seltener Fall eines einfachen chronischen Mittelohrcatarrhs. Archiv f. Ohrenheilkunde. N. F. H. I. B. I. 1873.

Prevost, J. J. Distribution of the chorda tympani. Comptes rendus. Tome LXXV. No 27. Paris, 1872.

Pomeroy, O. D. A purulent mastoid periostitis developed from an Otitis media, in which a communication existed between the mastoid abscess and the external meatus; slight damage to the membrana tympani and tympanic cavities. Relief by incision of the mastoid. N. Y. Journal of Med., Feb. 1873.

Pomeroy, O. D. Clinical records of ear-diseases from private and hospital practice. N. Y. Med Journal, Dec., 1872.

Pomeroy, O D. Contributions to Otology. The Med. Record, N. Y., July 1st, 1873.

Prout, J. S. Myringectomy, followed by decided improvement in the hearing power, in a case of adhesion between the membrana tympani and the promontory.

Rüdinger. Das häu'ige Labyrinth. Stricker's Handbuch. Leipzig. 1872.

Rüdinger. Zusätze zu den kritischen Bemerkungen des Herrn Dr. Brenner. M. f. O. No. 2. 1873.

Rüdinger. Ueber die Enstehungsweise der Knöchernen Canäle in der Umgebung der Paukenhöhle. M f. O. VII. No. 5.

Rüdinger. Ueber das Hören der eigenen Stimme durch die Tuba Eustachii. M. f O. VI. No 9.

Roosa, D. B. St. John. Chronic non-suppurative inflammation of the middle ear. N. Y. Med Jour., Feb., 1873.

Schultze, L. Ein Beitrag zur Technik der Nasendouche. Archiv f. O. B VI.

Meyer, Ludwig. Ueber das Darwinische Spitzohr. Virchow's Archiv. Band 53. Heft 4.

Müller, J J. Ueber den Ton des Ohrenklingens. Bericht d. K. Sächs. Gesellschaft d. Wiss. Mai. 1872.

Schwartze, Prof. H. Historische u. kritische Bemerkungen z. allgem. Therapie d. Ohrkrankh. Archiv. f. Ohrenheilkunde, neue Folge. Band I. Heft I. 1872.

Schwartze, Prof. H. Ueber die künstliche Eröffnung des Warzenfortsatzes. Leipsig, 1873, von DDr. H. Schwartze und Eyssel.

Seyfert. Ueber die vielfache Anwendung des Irrigationsapparates. Wiener Med. Presse. Nos. 33, 34, 36. 1872.

Trautmann. Der Gebrauch des Reflexspiegels bei der Untersuchung des Ohres und die Erzeugung vergrösserter Trommelfellbilder. Archiv für Ohrenheilkunde. N. F. 1 and 2. I Heft 1 Band. 1873.

Trautmann. Ueber den Werth der Ohrenheilkunde für die Militairæzrte. A f. O. N. F. 1 Band. 1873.

Voltolini. Abermals Otitis Labyrinthica. Monatsschrift für Ohrenheilkunde Jahrg. VI. No. 8.

Voltolini. Ueber den Lichtkegel am Trommelfelle. Monatsschrift für Ohrenheilkunde. Jahrg. VI. No. 8.

Voltolini. Eine Bohne im Ohre. Monatsschrift für Ohrenheilkunde. Jahrg. VI No. 9.

Voltolini. Ein Beitrag zum Werthe der Rhinoscopie für die Ohrenheilkunde. Monatsschrift für Ohrenheilkunde Jahrg. VI. No. 11.

Voltolini, R. Ein neuer Ohrenspiegel: die pneumatische Ohren-lupe. M. f. O. VII. 2. 1873.

Voltolini, R. Ueber das Emphysem bei der Luftdouche in das Mittelohr. M. f O. VII. No. 1.

Voltolini, R. Die Durchschneidung der Sehne des Tensor tympani unterLeitung meiner pneumatischen Ohrenlupe, vom hinteren Trommelfell-Segment aus. M. f. O. VII. No. 5.

Vulpian. Function of the chorda tympani Gazette Medicale de Paris. Feb. 15, 1873.

Wendt, H. Ueber das Verhalten der Paukenhöhle beim Fœtus und bein Neugeborenen. Archiv f. Heilkunde XIV. 2. 1873

Wilkins, John. Case of Mastoid inflammation, etc. "Practitioner." March, 1872.

Waldeyer, W Hörnerv und Schnecke Stricker's Handbuch der Physiologie. Wien, 1872.

Weber-Liel. (F. E. Weber.) Progressive Schwerhörigkeit. Berlin, 1873.

Wright, C. E. Eczema aurium. Indiana Journal of Med., Jan., 1873.

Yeats, W. Hæmatoma auris. British Med. Journal, June 21st, 1873

Zuckerkandl, Emil. Zur Entwickelung des äusseren Gehörganges. Monatsschrift f. O März, 1873

Zuckerkandl, Emil. Ueber die arteria stapedia des Menschen. M. f. O. VII. I.

Zaufal, E. Casuistische Beiträge zu den traumattischen Verletzungen des Trommelfells. A. f. O. N. F. 1 Band. 1873.

THREE CASES OF EAR DISEASE.

REPORTED BY ALBERT H. BUCK, M. D., NEW YORK CITY.

The histories of the following cases of ear disease, while presenting no features that are specially new to the aurist, are nevertheless of sufficient interest, from a pathological and therapeutical point of view, to justify me in reporting them here to-day.

Traumatic Aneurism of the Posterior Auricular Artery.

The first case is that of a plumber, twenty-one years of age, and in the habitual enjoyment of good health. Two weeks before visiting the New York Eye and Ear Infirmary, he was attacked with the symptoms of an acute inflammation of the right middle ear, namely: deap-seated pain, throbbing, tinnitus and deafness. When the pain became so severe that he could not tolerate it any longer, he visited the infirmary. An examination then revealed the fact that the outer canal was nearly obliterated by the swelling of its cutaneous walls, and that the skin over the mastoid process was red, swollen, and tender upon pressure. By gradual dilatation, the swelling of the canal was diminished sufficiently for me to obtain a view of the deeper parts. In this way it was ascertained that the inner half of the canal was occupied by a mass of granulation-tissue, the removal of which was easily effected by the snare. To relieve the congested condition of the mastoid structures, a free incision was made in a vertical direction behind the ear, and of such a depth as to divide the periosteum. The incision having been carried rather nearer to the angle of the ear than is usual under such circumstances, the withdrawal of the knife was followed by a smart jet of arterial blood. The bleeding was arrested by a compress placed over the wound and held tightly in position by a

suitable bandage. All efforts to place a ligature around the wounded vessel, or to control the bleeding by torsion, proved unavailing.

This occurred on the 9th of April. Three days later I saw the patient a second time. I found that the edges of the wound had united by adhesion, and that the pain had been entirely relieved by the incision. At the same time an abundant purulent otorrhœa had established itself.

On the 14th of April the resident surgeon noticed distinct pulsation over the wound. On the 15th, there was a circumscribed pulsating tumor, about the size of a hickory-nut. On the 16th, the pulsation ceased altogether, and the tumor diminished perceptibly in size. An incision was made in the line of the former wound, and a pretty firm, nearly spherical clot of blood removed from a distinct cavity. The outer portion of the clot was found to be laminated in structure.

As the hemorrhage recurred upon the removal of the clot, the cavity was stuffed with lint.

On the 18th, the removal of the lint was again followed by an arterial jet, which rendered it necessary to stuff the wound a second time and apply firm pressure by means of a compress and bandage.

The compress and bandage were removed the following day, but the lint stuffing was left to ulcerate its way out.

The patient subsequently made a rapid and good recovery.

Accumulation of Mucus in the Cavity of the Tympanum.

The second case commenced as an ordinary acute inflammation of the middle ear, resulting in a discharge of pus through a small perforation in the left membrana tympani. The patient was twenty-three years of age, in fair health at the time, though a frequent sufferer from articular rheumatism. His first visit to the infirmary was on the 19th of March, 1873. The acute symptoms had then passed off, and he was simply troubled with moderate deafness in the affected ear and a very slight discharge.

Ten days later, it was found that the opening in the membrane had healed over, and that the latter had resumed a comparatively healthy appearance. The only thing that attracted any special attention was the existence of a faint circular outline in the posterior half of the membrane. Siegle's tympanoscope failed to dislodge this supposed bubble from its position, and the auscultatory sounds were so thoroughly dry, that I very nearly abandoned the idea that there was fluid in the tympanum. To satisfy myself, however, on this point, I made a linear incision through the posterior half of the membrane, and performed suction through Siegle's apparatus. No fluid escaped. The linear incision was then converted into a crucial one, and suction again resorted to. This time a mass of tough mucus was brought through the perforation into the cavity of the meatus. This mass remained connected with the mucus within the cavity of the tympanum by a round cord of the same substance. By exerting traction upon this cord, it could be drawn out to a distance of several inches from the ear. The act of suction was repeated two or three times, and each time successfully. By having the patient perform Valsalva's experiment while I was exhausting the air in the meatus by aid of Siegle's apparatus, I found that the mucus could be drawn into the outer canal in larger quantity and more readily than without the patient's co-operation. The quantity of mucus thus withdrawn from the tympanum was so great that I could not avoid the belief that much of it must have come from the Eustachian tube. The hearing, which before the operation was about $\frac{0.1}{20}$, rose to $\frac{1.5}{20}$ for the watch. No inflammatory reaction followed, nor did the patient complain of any special feeling of soreness about the ear.

On the 2d of April, four days later, — the hearing in the mean time not having increased beyond $\frac{1}{20}$ for the watch, and the perforation having healed, — I repeated the operation. The quantity of mucus obtained was nearly the same as before, but the hearing remained unchanged. Thinking that very probably the ossicles were enveloped with mucus,

resorted to the use of a saturated solution of the bi-carbonate of soda for the purpose of liquefying the mass. The outer canal was filled with the solution, and then, while the patient performed the act of swallowing, firm pressure was made from without upon the tragus, thus forcing the fluid into the tympanum and through the Eustachian tube into the nostrils. At the end of a few minutes suction was again performed, and a certain amount of fluid withdrawn from the tympanum, but without any appreciable improvement in the hearing.

On the 3d of April, the operation was repeated. The soda solution was not forced in as before by means of pressure, but was injected through the perforation in the membrane by means of a hypodermic syringe, armed with a suitable bent nozzle of gold. This time, after the tympanum had been emptied as far as possible of its contents, a warm, weak solution of alum was injected into the cavity. The solution was of such a strength that the sour taste could barely be recognized by the tongue. It was allowed to remain about five minutes in the tympanum, and was then withdrawn in the manner already described. On this occasion, as on the two previous ones, the operation was not accompanied by pain. The fluids withdrawn from the tympanum were not tinged with blood, except on the first occasion, and then it was evidently due to the incision in the membrana tympani.

On the 4th of April, I found the patient in very great suffering from his ear. The pain, he said, came on early that morning, — that is, about twelve hours after the injection of the alum, — and soon became severe. He referred it to the region immediately behind and above the ear. On examination, I found that there was moderate tenderness over the mastoid process; that the membrana tympani was red and abnormally convex, the perforation in it having entirely healed. A vertical incision in the posterior half of the membrane gave vent to a large drop of healthy pus, and was followed by some relief from pain. Five leeches were ap-

plied behind and in front of the ear, and afterwards poultices.

From this time till the 13th of April — a little over a week — the patient enjoyed comparative freedom from pain. There was a free discharge of pus, through the perforation in the membrane and little or no fever. The mastoid region, however, continued to remain tender on pressure.

From the 13th to the 16th, the pain steadily increased and was referred chiefly to the region behind the ear. The motion of the jaws in eating or speaking also became more and more painful. A vertical incision an inch long was made behind the ear, down to and through the periosteum, in the hope of checking the advance of the trouble in this direction. Poultices were also applied.

On the 17th and 18th, increasing suffering.

On the 19th of April, his condition was the following: Temperature 101.5°; pulse 92, and rather feeble; motion of jaws very painful; meatus slit-shaped vertically, owing to the swelling of its walls; the wound behind the ear imperfectly healed.

After consultation with Dr. Robert F. Weir, the patient was etherized and an opening made in the mastoid process, with a one-fourth inch drill, to the depth of three fifths of an inch. The outer surface of the bone was normal in appearance; the mastoid cells were congested, small in size, and separated by strong, bony septa; no pus was found. The opening was made on a level with the upper wall of the meatus, and about half an inch behind it. The only point of interest in the operation was the great prostration which followed it. It was only by active stimulation (accomplished with great difficulty) that a fatal syncope was prevented.

From the 19th to the 22d, the soft parts behind and below the wound became more and more swollen and painful. The temperature, which on the 20th had fallen to 98.5°, rose slowly to 101°. Warm poultices were frequently applied, and iron and quinine given internally. From this date to the 27th, the patient appeared to be making rapid progress

toward recovery. During the night of the 27th of April, the pain again returned with great severity, the temperature rose to 100°, the pulse to 120, and the skin near the wound again became very much swollen and tender on pressure. From the 29th of April the recovery was steady and rapid.

On the first of June, I found the meatus normal, the membrana tympani entire, all tenderness gone, and the hearing reduced to about $\frac{0.1}{20}$ for the watch.

Acute Inflammation of the Middle Ear Resulting in the Formation of an Abscess in the Mastoid Cells.

The third case is that of a strong, healthy woman, twenty-six years of age, who, while nursing a young infant, was suddenly attacked with a pain in the left ear, which lasted about twenty-four hours and then passed off. A week later, the pain returned with still greater severity, and lasted three days before it began to diminish somewhat in intensity. With the abatement of the pain she noticed the appearance of a slight yellow discharge at the outer orifice. Five days later (Feb. 12, 1873), she visited the infirmary. The inner half of the meatus and the membrana tympani were found to be very much swollen, and accordingly they were incised.

For ten days subsequently she enjoyed almost entire relief from pain. On the 23d, however, she again began to suffer from her ear, the pain this time being referred chiefly to the region of the mastoid process. In the course of two days the pain became severe and extended over the entire left side of the head. In spite of this she continued to nurse her infant, and did not visit the infirmary till March the first. By that time there were evident symptoms of commencing mastoid trouble; namely, redness of the skin, œdema, and tenderness on pressure. No appreciable change had taken place in the condition of the meatus or membrana tympani. She was advised to have the bone perforated behind the ear, but she refused to submit to the op ration. A free incision, how-

ever, was made over the mastoid process, and the patient ordered to apply poultices to the part so long as any pain remained.

The patient's next visit to the infirmary was on the twelfth day of March. Her story was, that the incision had afforded her relief from the pain for a day or two, but that the ear soon became as painful as before. Her countenance also indicated prolonged suffering. The wound had entirely healed, but the mastoid integuments were red, swollen and very tender to the touch.

Her consent having been obtained, the patient was etherized and the mastoid process perforated, as in the preceding case. The outer surface of the bone appeared to be perfectly healthy. Instead of applying the drill at the spot usually selected, it was made to enter the mastoid process not far from its projecting tip. The cell-structure was thus reached at a very slight depth and the drill easily made to penetrate a distance of about a third of an inch. It was hoped that this more distant opening would suffice to relieve the trouble.

The day following I found her condition improved. The relief from pain was very decided.

March 14th. Erysipelas of left side of face.

March 15th. Entire face involved. Temperature, 105°. Pulse, 108. Wound healthy in appearance. Little or no pain about the ear.

On the 17th of March I found her again suffering pretty acutely from pain in the mastoid region. A careful exploration of the wound with the probe, led to the discovery of a small sinus in the upper portion of the process, at or close to the spot where the perforation is usually made. The probe could be passed into the bone to a depth of three-quarters of an inch without meeting any obstacle; it could also be rotated in a vertical plane as if in a cavity of considerable size. The drill was placed over the outer orifice of the sinus, and with one or two turns made to penetrate into a distinct cavity. On withdrawing the instrument, a moder-

ate amount of venous blood escaped, together with a little pus. The bony walls of the cavity were in a softened condition. The venous hemorrhage soon ceased of itself.

The next day, March 18th, I again found the patient comparatively free from pain. The erysipelas was evidently subsiding (temp. 101°), and she appeared every way better. The soft parts near the wound, especially behind it, were still very much swollen. From this time the improvement was steady and rapid.

On the 29th of March she left the infirmary. There had been no discharge from the meatus since the operation, and for more than a week she had been entirely free from pain. The wound still remained open, but it was very much reduced in size and in a perfectly healthy condition. I have not since had an opportunity of seeing the case, as the patient did not subsequently return to the infirmary.

Comments.

In regard to the case of traumatic aneurism, I would say, that the rarity of its occurrence in this particular locality is simply owing to the fact, that, when it becomes necessary to incise these parts, the incision is almost invariably made more posteriorly than in the present case. In this instance I purposely departed from the prevailing rule in order to ascertain a fact of some practical importance. In fully half of the cases of this kind, I have noticed that the loss of blood which ensued was exceedingly small, — much smaller than, in my opinion, was desirable, — and I believed that, to obtain uniformly a greater loss of blood, the incision should be carried close up to the angle where the skin is reflected from the mastoid process upon the auricle, and where the posterior auricular artery and vein lie. The experience gained in the present case shows, however, that the danger of simply nicking the artery, instead of dividing it, and the difficulty of placing a ligature around the divided vessel, deeply situated as it is among very firm and unyielding tissues, are

good and sufficient reasons why the established rule should not be departed from.[1]

The second case affords a fair illustration of one of the most obstinate forms of middle ear trouble, — the accumulation of a very tenacious mucus in the tympanic cavity. The subsequent progress of the case, while under treatment, also throws some light on the action of certain reagents upon the mucus membrane of the tympanum. Solutions of the bi-carbonate of soda, for instance, exerted no apparent injurious effect upon the mucus membrane. On the other hand, I am led to believe, from one or two experiments made with tenacious mucus which had been withdrawn from the tympanum, that we cannot depend upon the bi-carbonate of soda as a liquefacient of this abnormal secretion.

From a similar though less severe experience in two or three other cases, in which, however, there was a much larger perforation in the membrana tympani than in the present case, I believe that solutions of alum, no matter how weak, should in these cases either be introduced into the middle ear in very small quantity, or else abandoned altogether. My own observation would lead me to rank nitrate of silver as one of the safest reagents to employ in stimulating the tympanic mucus membrane to healthy action.

Another point of practical importance suggested by this case, relates to the manner of incising the membrana tympani. If the middle ear is filled with tenacious mucus, the linear incision will usually not suffice; a crucial incision is required to afford the necessary room for the escape of the mass.

Finally, the beneficial effects of perforating the mastoid process are brought out more clearly, I think, by this case than by any of the others previously reported by me.[2]

---

[1] Dr. Charles J. Kipp, of Newark, N. J., reported a very similar case to the New York Ophthalmological Society at one of its recent meetings. The hæmorrhage, in his case, was so serious as to threaten the life of the patient.

[2] Archives of Ophthalmology and Otology, Vol. III, 1, 1873. New York and Heidelberg.

Without this operation the error in treatment in the present case would probably have cost the patient his life.

The third case presents two or three points of interest. In the first place, had the patient consented to the operation for perforating the bone, at the time it was first proposed, it is more than probable that no pus would have been found, but simply a condition of congestion.

In the second place, it will be noticed that the bone was not perforated at the usual point, but some little distance lower down, near the tip of the process. As there was nothing in the appearance of the tone to indicate that pus had already formed beneath the surface, I made the perforation in the lower instead of the upper portion of the process for the express purpose of ascertaining whether or not the same degree of relief could be afforded by establishing a free opening at this remote portion of the communicating system of cells. As some might be deterred from performing the operation through fear of injuring the lateral sinus, it seemed to me desirable to ascertain whether this remote location, where the operation would be entirely free from the danger referred to, would not answer just as well, at least in the earlier stages of the disease. The difficulty, however, or rather impossibility, I should say, of determining the exact stage of the disease, and the danger of losing valuable time, so far as the patient's life is concerned, render it advisable to choose the usual location, higher up. Here, if pus has already formed, we shall reach it by the most direct route; and if the parts be simply in the stage of congestion, the relief will, at least, be as great as if the opening had been made lower down. As to the danger of wounding the lateral sinus, I have already stated* that it should not be a source of fear to the operator who uses his instruments cautiously.

---

* In the article above referred to.

CLINICAL CONTRIBUTIONS TO AURAL SURGERY.

BY CHARLES J. KIPP, M. D., NEWARK, N. J.

I. A case of Purulent Inflammation of the Middle Ear; Abscess of Mastoid Cells; Complete Recovery; Recurrence of the Disease twenty-one months later; False Aneurism of the Posterior Auricular Artery; Death from Pneumonia.

On the third of May, 1871, I was called to see, in consultation with Dr. Southard, Mr. D. A. D., æt. 58, a robust, powerfully-built man, of intemperate habits, who was suffering from a very painful affection of the left ear. The history was as follows: the patient has always been in good health; he has been deaf in, and has had, from time to time, an offensive discharge from right ear, for the last thirty-five years. At present, this ear is dry, and does not trouble him in any way. About eleven weeks ago he was suddenly taken with a severe pain in his left ear. Since that time this ear has gradually become more painful, and has at times discharged a small quantity of a thin fluid. He heard well with his left ear until a few weeks ago; now he is totally deaf.

Upon examination, I found the patient suffering from a very severe attack of acute purulent inflammation of the left middle ear. The lower portion of the external meatus was congested, the drum-head much swollen, of a deep red color, bulged outward and entire. The integument over mastoid region was neither red nor swollen. Neither the watch nor the voice could be heard with either ear.

The right ear was dry; the drum-head and the ossicles had been destroyed.

As the patient was evidently suffering very great pain, I immediately punctured the drum-head and forced the pus out of the opening by Politzer's method. The operation was

followed by almost instantaneous relief. Careful and frequent syringing with warm water, inflation of the middle ear by Politzer's method, and instillation of a very weak solution of sulphate of zinc, were recommended.

I saw the patient again on the 26th of May. The discharge was still profuse, and the hearing had not improved. The pain, which had been very slight for two weeks after the operation, had, during the past week, again increased in severity, and was now especially severe in mastoid process. Examination showed that the perforation in the drum-head had increased in size. The integument over mastoid process was of a red color and œdematous. An incision one inch and a half in length was at once made down to the bone, a half an inch back of the insertion of the auricle. About a teaspoonful of pus escaped. The bone was found rough, and in one place so soft that a sharp-pointed steel director could be pushed into the process to the depth of half an inch. The opening thus made was enlarged, and gave exit to a small quantity of pus. A tent was put into the opening and a poultice applied to the whole mastoid region. The inflation of the middle ear and the syringing with warm water were continued.

By the twentieth of July, five and a half months after the commencement of the attack, the discharge had entirely ceased, the perforation in the drum-head and the opening in the mastoid process had completely closed, and the hearing had so much improved that he could hear a watch of six feet normal hearing distance at two feet. He was so well pleased with this result that he discontinued treatment.

On the third day of April, 1873, twenty months later, Mr. D. consulted me again. I learned from him that he had been in excellent health, and that he had had no pains or uneasiness in or about his left ear since I had last seen him. His hearing had continued very good up to a week or ten days before, since which time it had gradually failed. He could hear the watch only when it was firmly pressed against the auricle. He had no tinnitus, but complained of a slight

throbbing in the ear. The drum-head was of a red color, swollen and entire. Auscultation revealed a gurgling noise in the drum. There was no pain in the ear, and the mastoid region was not tender on pressure.

The right ear presented the same appearances as on previous examination.

Believing that the patient was suffering from a second attack of purulent inflammation of the middle ear, I at once made a vertical incision into the drum-head, and then forced air into the tympanum by means of the catheter and air-bag. Only a small quantity of a yellowish fluid escaped through the opening. During the following two weeks the ear remained in about the same condition; the only change noticed being a more abundant discharge.

On the morning of the 18th of April, the patient complained of having had a very restless night, fever, and some pain in and behind the ear. On examination a large abscess was found over mastoid process, the integument of which was, however, neither red nor hot. A free incision gave exit to about two table-spoonfuls of fetid pus. The bone was found to be denuded of periosteum, rough, and very soft, and at a point about 4‴ back of the insertion of the auricle, and on a level with the middle of the external meatus was seen a small fistulous opening into which a fine probe could be passed to the depth of half an inch. After the opening had been enlarged, the cells were seen to be filled with pus. The external meatus was somewhat swollen and quite sensitive; the opening in the drum-head was patent. A cloth tent was put into the opening in the mastoid process and a poultice applied over the same. The air-douche and the syringing were continued.

On the 20th of April, a collection of pus was discovered above and in front of the external meatus, and the latter was now so much swollen that the drum-head could not be seen. Incisions were made in the abscess and the posterior wall of the meatus, from both of which a considerable quantity of

pus escaped. Rough bone was found beneath each of the incisions. The abscess was kept open by a tent.

The case progressed favorably up to May 6th, when a large abscess was discovered over the lowest portion of the mastoid process. A deep incision gave exit to a large quantity of pus. The hemorrhage from the incision was so profuse that it became necessary to apply a firm compress in order to arrest it.

During the next five days nothing noteworthy occurred; the discharge from the meatus and from the abscesses above and behind the auricle continued to be copious, and the hearing was evidently improving. There was but little pain in or around the ear.

Early in the morning of the 12th of May, the patient had a profuse hemorrhage from the incision in the abscess over the ap x of the mastoid process. Medical aid was at once obtained, and the bleeding arrested by pressure and the application of the persulphate of iron. I saw the patient later in the day; the hemorrhage had then entirely ceased.

On the following day, May 13th, the dressings were removed, and all clots taken out of wound. No bleeding followed.

Six days later, a soft pulsating tumor was noticed over apex of mastoid process, occupying very nearly the same position as the abscess which was opened last. The tumor was about 2″ long, 2½″ broad and 1′ high Pulsation was distinctly felt in every part of it, and could be stopped by pressure applied below the tumor. As there could be no doubt as to the nature of the swelling, and as to its origin, deligation of the posterior auricular artery was decided upon, but as no competent assistance could be obtained at the time, the operation was postponed until next morning. During the night the patient was aroused by a copious hemorrhage from the tumor. Digital pressure which was immediately resorted to, arrested the bleeding. On examining the parts, some hours later, the tumor was found to have almost entirely disappeared. Being, however, convinced that the

tumor noticed the day previous was an aneurism, and fearing a recurrence of the bleeding, I decided to tie the artery. The partially cicatrized incision into the abscess was re-opened and extended downwards, and by careful dissection the collapsed sac of a false aneurism, of the dimensions above mentioned, was brought into view. It was entirely empty. Its walls were tough, and about a line in thickness; its inner surface was white and glistening. Part of the cyst was situated immediately over the posterior auricular artery, with which it was intimately connected. A ligature was applied to the artery below the cyst, and the latter removed completely.

Two days later, May 22d, the patient complained of very severe pain in the right shoulder, fever, and dyspnœa. Upon examination, the usual signs of pleuro-pneumonia were discovered in right lung.

The ear and the abscesses around it were improving at this time; the discharge was less copious, and the watch could be heard when in contact with the auricle.

The patient died on the 28th of May.

Autopsy, sixty hours after death: The left auricle and the integument covering temporal bone were of a livid color. The bony portion of the external meatus, a part of the squamous portion immediately above external meatus, and the mastoid process were denuded of periosteum, rough and soft. The meninges were found healthy in every part. The subarachnoid space contained a considerable quantity of a slightly yellowish, clear fluid. No flakes of lymph or pus could be seen. The brain was apparently perfectly normal in every part. The lateral ventricles contained about the usual quantity of fluid. The lateral and petrosal sinuses were opened and found to be empty, and showed no signs of morbid action. The internal surface of both temporal bones, appeared normal in color and consistence. The middle ear and mastoid cells of left side contained but little pus. The drum-head was perforated and the ossicles were in normal position. The right ear was not examined.

The pleural cavity contained a considerable quantity of serous fluid. The right lung presented the usual appearances of pneumonitis; no signs of metastatic abscesses could be found in either lung. The heart was normal. The liver was very large, weighing about fourteen pounds, and presented the appearance of so-called nutmeg liver. The kidneys were imbedded in an immense mass of adipose tissue, and were large and white. All the other organs were healthy.

The points of interest in this case are:

First. The recurrence of the disease twenty months after an apparently perfect recovery from the first attack. The fact that in the interval between the two attacks the patient was entirely free from pain in or about the ear, and the acuteness of hearing was normal, proves, I think, conclusively, that no morbid process was going on in the ear during this period.

Secondly. The development of a false aneurism of the posterior auricular artery.

As the incision which wounded the artery was made parallel to, and at least half of an inch back of the insertion of the auricle, it seems probable that the artery occupied a somewhat anomalous position. The aneurism presented no unusual feature. The only case similar to the above that has come to my knowledge, occurred in the practice of Dr. A. H. Buck, of New York, about the same time that the above was observed.

II. A Case of Spurious Othæmatoma of both Ears, the Result of a Burn.

A boy, æt. 5, was brought to St. Michael's Infirmary on account of a very painful swelling of his ears. From the history it appears, that, about four weeks previous, his face and ears were burned by the premature explosion of gunpowder. The swelling of his ears was first noticed about two weeks later. There was no evidence that his ears had been bruised. When I first saw him, the face had entirely

healed. The auricles were pushed out from the head, and the upper two thirds of both were pear-shaped. The swelling was greatest at the top, and measured about 1¼″ from before backwards. The auricles were hot and very sensitive to the touch. The surfaces of the swellings were convex and smooth, and the skin of normal color, but looked as if it had been blistered. Fluctuation could be distinctly felt in both. An incision through the entire length of each swelling gave escape to a considerable quantity of a yellowish, glairy fluid. The swellings did not collapse after the evacuation of their contents. In both was found a cavity of about the size of a hickory nut, lined by a smooth, shining membrane. The anterior wall of both was about a line thick, and was apparently composed of thickened perichondrium; the posterior wall was formed by the cartilage. Under the daily application of tincture of iodine to the interior and exterior of the swellings, the auricles gradually diminished in thickness, and at the end of two months they had regained their normal size and shape. The only deformity remaining when I last saw him was a wrinkled condition of the fossa helicis.

On looking over the literature of the subject at my command, I was surprised to find that not a single case similar to the above had been recorded. Cases of spurious othæmatoma, the result of contusion of the auricle, with or without fracture, are not unfrequently observed; but as the consequence of burns, they appear to be very rare.

ON THE METHOD OF PERFORMING TENOTOMY OF THE TENSOR TYMPANI MUSCLES.

BY J. ORNE GREEN, M. D., BOSTON.

SINCE the introduction of the operation of tenotomy of the tensor tympani muscle several years ago by Weber-Liel, it has been gradually growing in favor, and seems to me destined to become a valuable addition to our methods of treatment, especially when its effects have been so thoroughly studied that it can be performed in the earlier stages of disease, and not, as has been heretofore done, as a final resort in desperate cases. The operation is yet in its infancy, and I do not propose here to discuss or give any judgment on its value, but merely to speak of the methods of performing it.

Weber-Liel, as is well known, proposed at first, and still uses, a small, hook-shaped knife, lying at nearly a right angle with its shaft, and this shaft made to revolve by means of a ratchet and wheel in the handle, so that the inner edge of the hook-shaped knife would cut downwards. Perforating the membrana tympani just in front of the short process, the knife was passed into the tympanum, hooked over the tendon of the muscle, and the tendon divided by rotating the shaft. Gruber simplified and improved the operation of Weber-Liel by substituting for the complicated knife a simple lance-shaped knife, slightly bent at the point. In operating he perforated the membrane at the point recommended by Weber, and with the curve of his knife pointing backwards, transfixed the tendon of the muscle near its point of insertion on the manubrium of the hammer.

Both of these operations were to me unsatisfactory: first, because they required us to operate on the anterior segment of the membrane, which is always the least accessible portion, and often almost wholly concealed from view, owing to the inclination of the membrane, and the projection of the short process of the hammer. This objection was fully recognized by both these authors, who acknowledged the absolute im-

possibility of so performing the operation in many cases, and say that in such cases it *may* be advisable to operate through the posterior segment. Secondly, clinical and anatomical investigation led me to think that the course of the muscle from its insertion on the hammer is not so directly inwards as is generally supposed, but in the majority of cases is somewhat backwards as well as inwards. The relaxation of the posterior segment of the membrana tympani, and the increased tension of the anterior segment, as so frequently seen when the membrane is drawn inwards, can be explained in no other way than that the course of the muscle is backwards; and the fact that in the majority of cases the hammer while drawn inwards is also drawn backwards, points to the same course of the muscle. In a recent article in the Monatschrift für Ohrenheilkunde, April, 1873, Gruber shows that the end of the osseous canal from which the muscle passes out, varies somewhat in its position, but that it generally lies far behind the line of the manubrium; he says: "In the majority of temporal bones examined, the semi-canal of the tensor tympani muscle ended nearly at the middle of the upper edge of the oval window; in some cases at the posterior part of this edge, and only in a few cases did it end in front of the middle of the window;" and a little farther on, "we see that, in order that the tendon, in the majority of cases, may reach the hammer, it must pass from above, behind and within, in a downward, forward, and outward direction."

During the last winter, while in Vienna, where I could obtain an abundance of material, I made a special study of the operation, and performed it a great many times on preparations. Weber's method I immediately discarded on account of the complicated action of the knife, feeling confident that a more simple method must be found. By Gruber's method, I found that although the section of the tendon was in some cases successfully performed, in a great many it was impossible with the curvature of his knife to reach it, and this by no means always owing to want of space either in the ante-

rior segment or in the meatus, but on account of the muscle running so far backwards that the knife did not reach it. I then determined to try section through the posterior segment between the manubrium and the long process of the incus. This I did by reversing Gruber's knife, turning the curve forwards, and found that the tendon could be easily and surely reached; but as his knife was designed rather for transfixion than for cutting upwards and downwards, I had a knife made with the same curve, but with a round instead of a sharp end, and with slightly curved edges. With this I was enabled in *every case* to divide the muscle a short distance from its exit from the osseous canal, and in no case were the other ossicula even touched. The course of the muscle seemed to vary somewhat upwards and downwards, and in some cases it was necessary to incise the membrana tympani as far as the edge of the osseous tympanic ring; in such cases if the chorda tympani was situated low down it was cut through. This division of the chorda tympani was the only accident met with in the operation, and the only one which seems to me likely to occur. The danger of wounding the carotid artery in those exceptional cases where its osseous canal is very thin, or entirely wanting, is obviated, in great measure, by having the end of the knife round instead of pointed; and again, it is almost impossible for the end of the knife to reach so far forward. The division of the chorda tympani nerve is an accident of very little consequence, as the nerve is of comparatively slight importance, and the ends would probably unite again very soon.

The advantages of tenotomy through the posterior segment are these: we operate through the portion of the membrane that is always distinctly to be seen, instead of through the anterior segment which is always the most difficult to be seen, and to be got at; we are entirely independent of the projection of the short process, which often wholly conceals the upper part of the anterior segment; we can reach much more readily the muscle; we can divide it more easily if it

lies a little higher or lower than we had at first supposed, as we are better able to turn the knife upwards or downwards; and finally, if the course of the muscle is abnormal and farther forward than usual, we have much greater freedom in the meatus to carry the handle of the knife backwards, and thus bring the point forward in the tympanum. The operation through the posterior segment is also more universally applicable than that through the anterior segment. The only objection to this method of operating is, that the muscle is divided near its exit from the osseous canal, and the long, stiff tendon is left projecting, and might again adhere; to obviate this, after section of the muscle, I should always pass a bent probe into the tympanum and bend the tendon away from its natural position.

My rules for performing the operation are as follows: with a paracentesis needle to perforate the membrana tympani a short distance below the line of the short process, and from a half to three quarters of a line behind the manubrium, and then prolong the incision upwards nearly or quite to the osseous wall; the curved tenotome can then be inserted, at first directly inwards so as to escape the manubrium, and then forwards; by moving it up or down the muscle can now be felt and divided; if there was any bleeding perceptible in the tympanum I should wait for it to cease, and then with a small probe press the tendon from its position, and follow the operation immediately by the air douche through the catheter in order to separate the divided ends as far as possible.

Twice within the last month I have performed the operation on the living subject, and although too short a time has elapsed for me to give an opinion on its therapeutical value, I can say that the operation, as above described, was readily performed without hemorrhage, except at the incision of the membrana tympani; that it produced a perceptible relaxation of the membrane, and that it was followed by no inflammation whatever. Both of the patients were nervous ladies, and I used ether to ensure perfect quiet of the head; in both

the wound in the membrane healed within twenty-four hours, and in four or five days the slight congestion and swelling had entirely disappeared; in neither were there any symptoms to show that the chorda tympani had been wounded.

Gruber, in the article already referred to, suggests that the position of the manubrium of the hammer affords us a means of determining the course of the muscle: if, he says, the manubrium is drawn directly inwards, the course of the muscle is directly inwards, and if the manubrium is drawn somewhat backwards, the course of the muscle from its insertion is in the same direction: and from the appearance of this bone he would decide on what point of the membrane it is best to operate: "a general rule for selecting the point of perforation of the membrane in tenotomy of the tensor tympani muscle cannot be given, but the appearances of the membrane and particularly the position of the manubrium must determine the field of operation." My observations, which, it is proper to state, were made entirely independent of Gruber's, confirm all that he says of the course of the muscle, and, I think, prove theoretically the possibility and advisability of substituting the posterior for the anterior segment as the point of selection for entering the tympanum. Practice alone must prove which produces the best results.

The preparations which I lay before the society show the results of the operations which were performed just as they are done on the living subject, the tympanum afterwards being carefully opened to show the result; they are not selected specimens, for in every case experimented on the result was the same. I also show the various forms of knives; in practice I have no doubt that knives of different curves, and perhaps angles, will have to be used to suit all cases.

THE VALUE OF TENOTOMY OF THE TENSOR TYMPANI MUSCLE.

BY R. M. BERTOLET, M. D., PHILADELPHIA.

THE limited number of cases operated upon, as yet, hardly permits of any very positive conclusions being formed as to the value that will ultimately be attached to tenotomy of the tensor tympani muscle; however, the large proportion of favorable results that we have obtained, thus far, seems to warrant the prediction that it is bound to become, in a certain class of cases, one of the most important remedial measures at the disposal of the aural surgeon. This will certainly be the case, when the comparative simplicity and harmlessness of the procedure is more generally recognized, when the indications for the operation are more clearly enunciated than at present, and when tenotomy is no longer resorted to merely as a *dernier* measure.

The sixteen cases operated upon were not such as presented the most favorable symptoms, nor were they a class that would be selected with a view towards gaining brilliant results. They were all cases in whom the chronic affection had existed for years, and where all the usual methods of treatment had failed to give any relief or to abate the distressing tinnitus aurium, from which patients are so solicitous to be freed. To avoid repetition, and to prevent this paper assuming undue length, we will not enter into the history of each individual case operated upon, but will merely give an outline of the principle objective and subjective symptoms presented when the tensor tympani muscle is thrown into a state of permanent contraction. In order to relieve the troubles caused by the excessive retraction or contraction of this muscle, the division of its tendon was first performed by Weber-Liel, the feasibility of the operation having been previously pointed out by Hyrtl.

As yet, too few reliable data of the pathological changes supervening upon chronic non-suppurative affections of the

middle ear, are at hand to enable us to determine what is the precise process leading to this fixed rigidity and shortening of the tensor tympani muscle. Suffice it to say, that this condition does frequently exist, and often is, apparently, the sole cause of the patient's malady. Hypertension of the tympanic and labyrinthal structures necessarily must ensue, more or less impairing the conduction and perception of the waves of sound. The never absent tinnitus aurium may be accounted for, according to Gruber, by the interference with the labyrinthal circulation, caused by the increased pressure of the stapes upon the fenestra ovalis. These subjective phenomena cannot, however, be regarded as a reliable evidence of the contracted muscle, since they are often caused by numerous other abnormal states of the tympanic and labyrinthal cavities and their structures. The marked retraction of the lower end of the malleus, seen in these cases, is a very characteristic, but by no means pathognomonic sign of the contracted tensor, since it also may be brought about by various other methods; such as occlusion of the Eustachian tube, false adhesions, attachment to the promontory, and anchylosis.

The patient's history is generally one of progressive difficulty of hearing, with a decided diminution of the hearing distance for musical and other sounds. There is present, owing to the increased labyrinthal pressure, a more or less constant tinnitus aurium, growing more and more intense and annoying until the various "noises in the head," described as roaring, buzzing, hissing, ringing, etc., so distract the patient as to often render him incapable of enjoying social intercourse. A sense of fulness in the ears is also rarely absent. Vertigo, and even unsteadiness of the gait, may finally be added. Upon inflating the middle ear, either by Politzer's method or by means of the Eustachian catheter, no mucous râles are perceptible with the diagnostic tube, though the tubæ Eustachii are perfectly pervious. Siegle's pneumatic speculum applied to the external auditory canal shows that the excursions outwardly of the membrana tympani and

malleus are very limited in extent, though no synechia have been formed.

Upon examining the membrana tympani, it is seen to be unusually concave. Its cone of light is often entirely absent, or else striated and irregular in appearance. Frequently the promontory is seen shining through the membrane. The handle of the malleus is drawn inwards so as to appear foreshortened; its processus brevis bulges outwardly, and the anterior and posterior folds appear elongated. The malleus often assumes a nearly vertical position; less frequently it is drawn backwards and upwards so that it lies in nearly a horizontal position. The malleus is, also, often slightly rotated upon its axis, so that it appears wider than usual; while the anterior segment of the membrana tympani appears sunken.

Such, then, as briefly given above, are the more important features and symptoms attending the contracted state of the muscle under consideration,—no one of which, *per se*, can be regarded as typical, not even the excessively retracted handle of the malleus. It is only when all, or at least a greater number of, these manifestations are present, that the diagnosis of the contracted tensor tympani becomes admissible.

It is generally admitted, how very little, if any, benefit is derived from the use of medicated vapor, spray, or liquid applications to the tympanic cavity in those cases of chronic non-suppurative affections of the middle, where there is no thickening of the lining mucous membrane, nor any serous or mucous accumulations within the tympanic cavity; cases in whom all the evidences of an inflammatory character have long subsided before medical relief is sought from the increasing deafness and tinnitus aurium. When the subjective and objective symptoms presented are such as to leave no doubt that the contraction of the tensor tympani is the chief source of the existing troubles, then the division of its tendon, according to our experience, affords by far the most rational and successful method of treatment as yet suggested.

In performing the tenotomy, we have invariably selected as the site for the initial incision through the membrana tympani, the point a few lines in front of, and on a level with, the processus brevis of the malleus. This incision has to be made with the lance-shaped paracentesis needle, if the same tenotome that we have come to prefer, is employed. This instrument is made after Frank's[1] modification of Weber-Liel's tenetome, a simplification of the latter's instrument, in which the beak, pointing directly backwards, is attached at an angle of 60°. It is more readily inserted and removed through the slit-like opening in the membrane without injury, and is less liable to be caught on the ossicles. As its cutting edge points downwards, it necessitates the use of an additional instrument for the paracentesis; a seeming disadvantage only, however, as the hemorrhage ensuing never is very great, and there always is ample time to proceed leisurely with the operation, — the patient being firmly secured in a head rest and etherized. This tenetome, after its introduction into the tympanic cavity, is rotated up in its longitudinal axis and hooked over the tendon of the muscle by means of the ratchet movement attached to the handle of the instrument. An audible snap does not always attend the division of the tendon; and even when heard it is advisable to take a sound, one end of which is bent at a right angle, introduce it through the opening in the membrana, and make sure that complete division has been made. Unless the external meatus be exceptionally wide, the truncated short speculum is indispensable.

If no unfavorable reaction ensues, the wound in the membrana closes within forty-eight hours. To prevent the possibility of union of the divided ends of the tendon, the air douche should be employed. Whether such a union ever does take place, remains to be definitely settled by a post-mortem examination of some case operated upon during life. In the mean time must be admitted the possibility of such an

---

[1] Monatschft. f. Ohrenheilkunde, No. 7, 1872.

occurrence, with the subsequent return of all the previous subjective troubles. A sufficient interval since the time of operation has not yet elapsed, in the majority of the cases herewith reported, to permit any conclusions being formed upon this point. All being dispensary cases, many of them, after a few months' observation, have unfortunately already been lost sight of.

CASES UPON WHOM TENOTOMY OF THE TENSOR TYMPANI HAS BEEN PERFORMED.

No.	Sex.	Age.	Ear operated upon.	Duration of the affection in years.	Hearing distance for watch before the operation.	Hearing distance after division of the tendon.	REMARKS.
1	F.	45	L.	7	Contact.	..	Only temporary cessation of the tinnitus.
2	M.	50	L.	8	0	Contact	Cessation of the noises.
3	M.	50	R.	8	1″	6″	Cessation of the noises.
4	M.	41	L.	5	0	..	Otitis media purulenta set up.
5	M.	39	R.	2	0	12″	Complete cessation of the noises.
6	F.	28	L.	yrs?	Contact.	..	Resulted in a purulent inflammation of the middle ear.
7	F.	28	R.	yrs?	0	..	
8	M.	60	L.	3	Contact.	Contact.	Diminution of the tinnitus.
9	F.	19	R.	2	2″	36″	Entire subsidence of the tinnitus in both ears.
10	F.	19	L.	2	3″	36″	
11	F.	47	L.	4	0	Contact.	Diminution of noises, eventually worse.
12	M.	36	L.	3	Contact.	Contact.	Noises disappeared in both ears.
13	M.	36	R.	3	1″	1″	
14	M.	62	L.	12	0	0	Noises greatly diminished.
15	M.	62	R.	12	0	0	No improvement.
16	F.	47	R.	4	1″	1″	Noises only slightly relieved.

In six patients, both the right and left ears were operated upon; in the four remaining cases only one ear was selected.

Ten of the tenotomies, which equals 62 per cent of the whole number operated upon, were followed by favorable results; that is, the tinnitus either entirely ceased or was so decidedly diminished as to no longer prove a source of annoyance to the patient.

Case No. 4 was not seen until a week after the operation. He had ended a debauch in the damp cells of a police station; quite a profuse discharge from the left ear occurred.

A similar unfavorable termination occurred in Nos. 6 and 7, the patient being an exceedingly anæmic and debilitated woman. The first case, although stating very positively immediately after the operation that the tinnitus had entirely ceased, yet upon her return the next day, said the noises had again commenced; though a slight improvement in the hearing distance continued.

A similar history to the preceding was presented by the eleventh case. No improvement whatever occurred in the fifteenth case, thus making a total of six, more or less, complete failures.

We have only given in the table the hearing distance as measured with the watch (average hearing distance, 72 inches), although that of voice and tuning-fork were noted in every case. A glance at the tabular statement will show that, even in the more successful cases, the hearing distance was not so materially improved by the tenotomy as the results obtained by others would lead us to expect.

We have come to regard tenotomy of the tensor tympani as a valuable aid in allaying annoying subjective symptoms, of doubtful utility as a means of improving the impaired hearing. We heartily agree with Gruber,[1] when he says: "As this operation is only undertaken in such cases where we are unable to do anything else, we must certainly regard it as an addition to operative otology, and must do our best towards its further development."

---

[1] Wiener Med. Zeitung, No. 8, 1872.

CASES ILLUSTRATING SOME OF THE RESULTS OF PARACENTESIS OF THE MEMBRANA TYMPANI, AND OF THE INTRODUCTION OF POLITZER'S EYELET.

BY OREN D. POMEROY, M. D., NEW YORK.

Case I.

T. Doyle, aged twenty-four; disease, otitis media chronica; duration, six years in the left and two years in the right. A constant and very troublesome tinnitus aurium commenced in the left ear, ode year after the first symptoms. The tinnitus in the right commenced one year since. Hearing distance for the left, watch 2″, after inflation 9″; voice 5′; right, w. 15″ after inflation 20″; voice nearly normal.

The patient was treated in the ordinary manner for nearly two years, interrupted from time to time as the symptoms showed amelioration. The hearing of the left at the end of this time was about 6″, and the tinnitus was somewhat diminished. One year after the commencement of treatment, the right ear was attacked by catarrhal inflammation of a subacute character, which lowered its hearing to nearly that of the left, *i. e.* w. 3″, voice 12′, and was accompanied by slight tinnitus. Treatment at the end of the two years seemed to aggravate the symptoms; *i. e.* the tubes were obstructed, the tinnitus was worse, and the deafness more profound.

Treatment was then interrupted for three or four weeks, with improvement to some of the symptoms.

Deafness and tinnitus, however, remained, but the tubes were pervious. One year since I performed paracentesis of the membrana, commencing with the right, which at once resulted in improvement to the hearing, and suppression of the tinnitus.

During this year the right membrane was punctured twice, and the left three times.

The result of the punctures not being permanent, a repetition was indicated. At present, Aug. '73, there is a little noise once or twice a week, and then only for a few minutes at a time. The hearing is, right w. 8″, voice 3 1-2′. Left, w. 6″, voice 3′.

As the catarrhal symptoms are mostly relieved together with the other symptoms, the treatment is discontinued. The right tube is somewhat too pervious, possibly owing to excess of catarrhal treatment (mostly done by Arg. nit. applied to mouth of tube by strong solution). The relief to the tinnitus by the punctures was sudden and striking, the patient stating that it "killed the noise."

The unpleasant feeling of fulness, pressure, weight, or anomalous sensations of discomfort in the cavities was also relieved.

This patient came more than once, of his own accord, to have the operation performed.

Case II.

Mary Coffey, aged thirty-seven; disease, otitis media catarrhalis chronica; duration, right ear eight years and left ear twelve years.

Naso-pharyngeal catarrh accompanied the ear symptoms, and was very troublesome.

Hearing 12″, by the watch, in right ear, and 11″ in left. Tinnitus aurium in both, but much worse in the left.

In the right it was only in and about the ear, but in the left it not only occupied the region of the ear but the whole side of the head.

The noise in the left commenced eight years since, and is constant and very troublesome, so as to prevent sleep. In the right it is not constant and much less troublesome, and only commenced three years since.

The patient is under observation for one year and has been treated a portion of the time for nine months. She has been treated for the catarrh, principally by Arg. nit. spray, and the same applications to the mouth of the Eustachian tubes

by the faucial catheter. The result has been cure of the catarrhal symptoms, great relief to the tinnitus of the right ear, and slight improvement to the noise in the left ear. After seven months of this treatment the left membrane was punctured five times during the next three months, and which was the only treatment employed after the above date. The tinnitus is not cured "altogether," but "mostly," as the patient expresses it. It only occurs for a few minutes at night when she is quiet in bed, but gives no trouble. There is *no noise at all* in the right ear.

The hearing distance is greatly improved. The unpleasant feeling of pressure, obstruction, or distension within the cavity, has also entirely disappeared. It is worthy of note that the noise in the right ear has disappeared since puncturing the left. I think I have previously noticed improvement to the tinnitus in the ear opposite to the one punctured, and, as I believe, in consequence of the puncture. It is not easy to explain, nor is it easy to state, why these sounds occupy the head sometimes, to the exclusion of the ears.

Case III.

Miss H. McG., aged twenty-five; disease, catarrh of the right Eustachian tube, of one year's duration; patient inclined to a tuberculous constitution; had sisters die of phthisis. H. D. $\frac{4}{8}'$, but after the air bath $\frac{7}{8}'$; membrana of about the same appearance as the other, which is normal. H. D. of left is also normal. Applied on account of tinnitus aurium which troubled her constantly, so that she could not sleep nearly enough. Had been treated for brain disease. I also administered Bromide of potass, without result. In the earlier part of the treatment large doses of morphine were administered to produce sleep. After this, considerable relief to the tinnitus resulted from applications of one drop, and sometimes a less quantity, of a 480 gr. solution of Arg. nit. by the faucial catheter to the mouth of the tube, with the air-bath administered at the same time.

After about two months of this treatment, administered every second or third day, the H. D. was pretty constantly at $\frac{7}{8}$′, but still with considerable tinnitus and unpleasant feelings within the tympanic cavity.

I then punctured the membrane and repeated the operation three times during the next two weeks, which resulted in nearly complete relief to the tinnitus for three months, when the patient returned with a considerable amount of noise in the ear and head, with some symptoms resembling brain trouble.

As she has never returned since this time it may be inferred that the treatment was unsatisfactory. She had a great dread of the punctures, apparently experiencing considerable pain during their performance, although no inflammation ever resulted. I infer that the paracenteses were active agents in relieving the noise, although the tube was nearly or quite normal previous.

As the hearing was so nearly perfect ($\frac{7}{8}$.) no perceptible improvement could have been expected. It may be worthy of remark that it was not injured by the operations.

The position of the membrana was not *apparently* altered by the paracenteses.

Case IV.

Miss Kate D., aged twenty-one, is deaf from the results, no doubt, of a former attack of catarrhal otitis media. The membrana are sunken, and somewhat opaque. The H. D. is, voice about 10″; not benefited by Politzer or catheter.

Has had tinnitus aurium moderately, and not constantly.

Ordinary treatment was applied for six weeks without any effect.

On May last, the membranes were punctured, one at a sitting, every second day, unless a previous puncture had remained open or had caused a sufficient amount of soreness to exist at the end of that period to contra-indicate repetition. In this case it was intended by a somewhat systematic course of puncturing to so diminish the superficial area of the mem-

branes that a more normal position might be maintained; there being *no* indication to puncture on account of adding air supply to the cavities as the tubes were normally pervious. In two or three of the punctures, so much inflammation resulted as to require leeches and blisters to subdue it. The effect of the punctures was not immediate, or at all striking. After about three weeks, the hearing began gradually to improve, and the unpleasant intra-aural sensation was mostly relieved, but the tinnitus was not benefited in the least. The treatment was continued for about ten weeks, when the membranes had been pricked about twelve times apiece. Result: H. D. increased from voice 10″ to about 30″; much more natural feeling in the tympanic cavities, but no effect on the tinnitus. In this case, and I may say in all the others, the appearance of the membranes on inspection did not seem at all changed; that is, the signs of sunken membranes still existed as before.

It may be worthy of remark, however, that so slight a change in position of the membrane as not to be noticeable to the eye, is amply sufficient to produce beneficial changes in the subjective symptoms of the patient.

A membrane so sunken by ordinary tubal catarrh that the hearing is greatly diminished, may by a single inflation be so far restored to correct position that the hearing may at once be perfected, without appearing to the eye to have been changed but slightly. I believe all observers admit, that once the membrane shows positive signs of being sunken, which have existed for a few weeks or months, that no treatment will restore the normal appearances of the membrane, although the patient may be otherwise successfully treated.

Case V.

Mr. W., aged twenty-five; disease, otitis media catarrhalis chronica, with naso-pharyngeal catarrh; duration, one year.

First noticed it in the left ear; never was aware of trouble in the right.

Prominent symptoms, deafness, tinnitus, and unpleasant sensations in the ear. The tinnitus could be scarcely fixed in either ear, but rather in the head. H. D. R. w. $\frac{6}{60}''$, L. w. $\frac{15}{60}''$.

Was treated five weeks by the ordinary means, with a doubling of the H. D. of left, but no other change.

At the end of this treatment the membrane of the left was punctured twice, at intervals of five days. The result is complete relief to the tinnitus. This case is recent, it having been discharged within about three weeks from date.

Quite likely further treatment will be needed. The catarrhal symptoms had nearly all disappeared. This is the second case in this category when tinnitus in the *head*, felt nearly as much in one ear as the other, has been relieved by pricking only one of the membranes.

Case VI.

Mr. B., aged twenty-five; disease, catarrhal inflammation of the middle ears, of about four years' duration; H. D., voice, 20″ in right and 15″ in left.

The tubes are insufficiently pervious, and the H. D. is slightly benefited by moderate inflation, but diminished by excessive inflation. Has been treated four weeks by the ordinary means with little improvement.

At the end of this time I punctured the left membrane twice in one week, which has resulted in a noticeable improvement to the H. D., a relief to the unpleasant intra-aural symptoms, and only slight diminution to the tinnitus.

In this case the punctures seemed to "help along" the case a little without accomplishing very much.

Case VII.

Mr. J. T. C., aged forty-five, has for the last five or six years complained of a peculiar rattling in the left ear, with a moderate amount of deafness.

Both of these symptoms are much relieved for a few minutes by a sudden and rapid inspiration through the nostrils.

On inspection, the membrana is seen to move excessively; the light spot is diminished in size and dull. The membrane is somewhat convex towards the meatus, but assumes a more natural position during the snuffing inspiration before alluded to. I at once punctured the membrane and the patient left my office. For the next three or four weeks I did not see the patient, when he presented himself stating that the deafness had been greatly relieved and the flapping sound in the ear had nearly disappeared. He rarely needed to perform the snuffing through his nose to relieve the unpleasant symptoms, and was much pleased with the result of treatment. I inferred that the peculiar condition of things was due to a previous otitis, which was accompanied by too frequent performance of the valsalvian experiment by the patient.

Case VIII.

Miss Schwammer, aged thirty; disease, otitis med. chronica, with occasional acute symptoms, as recurring attacks of pain, throbbing, etc.

The ear trouble dates back two years, and is in the right; the left is nearly normal. Treatment commenced in July, 1872. Leeches were first used to relieve the pain and throbbing, after which Arg. nit. was applied to the tube by the faucial catheter, and the air-bath administered. The Eustachian tube was not normally pervious, and the H. D. by the inflation reached from w. pressed to w. 2″. This treatment was persevered in for about six weeks with some gain to the hearing, that is it "kept up" to the highest point very much better than before, although the tinnitus and unpleasant intra-aural feelings continued. I then performed a paracentesis of the membrane, which much relieved the tinnitus, and noticeably so while the puncture remained open. This puncture was repeated about four times during the next month; on one occasion the puncture remained open fourteen days; and on another, six days. Again, it would close in a few hours.

The patient invariably expressing the opinion that the tinnitus was diminished much more when the puncture remained

open, and that the hearing was improved, I then determined to introduce Politzer's eyelet, which was accordingly done. During the next seven weeks the eyelet was introduced three times. The first time it caused so much pain that the patient pulled it out during the first twenty-four hours; the opening remained for several days, and there was some pain and a purulent discharge. Leeches were applied, and afterwards a blister behind the ear. After about ten days the eyelet was again inserted, which remained in situ about five days, when it was discharged by the purulent process set up in consequence of its presence. The aperture remained open about the same time as before. After all the unpleasant symptoms had subsided the eyelet was again inserted to be thrown off by a similar process recorded in the last introduction. Leeches and blisters were needed to subdue the inflammation set up by this introduction similar to the experience in the first experiment. Very naturally further treatment of this kind was interrupted by the untoward results. The conclusion arrived at by this and other similar experiences was that the eyelet is a dangerous foreign body in the drum membrane, and with this and other experiences to be related can fairly be denominated an unjustifiable mode of treatment. Although Prof. Politzer has never made any specific statement as to the bad effects of its use, it is worthy of record that he has not used it frequently latterly. After full recovery from these results of treatment, the tinnitus continuing, and the unpleasant symptoms of pressure returning, I again had recourse to the punctures, which were repeated two or three times with almost complete relief to the tinnitus and intra-aural symptoms. Being absent during the winter I had lost sight of the patient, but on my return in the spring of 1873, she applied to me for a repetition of the punctures, which had produced so much relief. The punctures have been repeated about twice during the three months immediately after my return. The H. D. was not materially affected by the eyelets, it remaining about as on the commencement of treatment.

The patient presenting herself for a repetition of the operation seems an evidence of its satisfactory effects. Even a relief to the intra-aural symptoms which are often so unpleasant is perhaps enough to justify its performance. In this and all the other cases here reported, this operation was not done until other means had been fairly tried.

Case IX.

Mrs. C. O. N., aged forty-five; otitis med. chron. in L., R. nearly normal; duration six years; prominent symptoms, tinnitus aurium, unpleasant sensations in the ear, with occasional vertigo, and moderate deafness, *i. e.* w. 4″, voice 3′. There was some pharyngeal catarrh. Tube pervious by Valsalva's operation, with a slight addition to the H. D. as a result. At first the patient was treated by Arg. nit. to the Eustachian tube, together with catheterization. The result was a more permeable tube and the consequent improvement to the H. D. Otherwise the symptoms remained the same as before. This treatment continued, somewhat interruptedly, for about two months. Paracentesis was then done, the previous treatment being stopped. During the next four weeks the membrane was punctured three times. It remained open on two occasions several days, and on the other only a few hours. While the air passed through the perforation all the unpleasant symptoms disappeared, although on closure the old symptoms did not all recur. I then introduced a Politzer eyelet. It caused a considerable purulent otitis media, which was subdued partially by leeches and blisters, but the process was not wholly stayed until the eyelet was thrown off, a period of five or six days from its introduction.

During the healing of the perforation left from the eyelet, as well as while it remained in the membrane, the ear symptoms were all aggravated, as might well have been supposed.

After a period of about three weeks, another eyelet was introduced, which caused fewer symptoms of inflammation than the first, and which remained in about eight days.

There was, however, a purulent discharge, and some pain. Blisters and washing out with warm water, however, pretty well subdued the process, but as in the first instance the discharge continued until the eyelet fell out. In this instance the tinnitus was somewhat ameliorated. Naturally enough further persistence with this instrument was discouraged by the untoward result; a similar conclusion was arrived at as in the case of Miss Schwammer, to wit, that it was a dangerous foreign body in the drum membrane. After the healing of this last perforation the H. D. was a little diminished from the first estimate; the tinnitus remained as before. Since this time the membrane has been repeatedly punctured, in each instance giving more or less temporary relief to the tinnitus; so much, indeed, that the patient has several times returned for a repetition of the operation. The H. D. has been moderately improved for a few hours only after each puncture. There were in this case also occasional symptoms of vertigo, which subsided after the punctures were made.

Case X.

Julia Burk, aged fifty; disease catarrhal otitis media, of the dry variety, or "Proliferous" Inflammation (Roosa) of the left ear, of ten years' duration, never any trouble in the right. Symptoms, almost constant and very troublesome tinnitus, and unpleasant "pressure" symptoms in the tympanum. Was treated three months by the ordinary means, with a little improvement to her symptoms. The membrane of the left ear was very much sunken, with some loss of polish, although the light spot was visible. At the end of this time, I inserted a Politzer's eyelet, which, as in the case of its predecessors, excited a purulent otitis media, with considerable discharge, which in about three days had washed out the eyelet. The aperture remained open about a week; the inflammation and discharge slowly subsided, and at the end of three weeks, there being no more unpleasant symptoms, a second eyelet was inserted, with somewhat better results than the first, *i. e.* it remained in about six days, pro-

duced only a moderate degree of pain and discharge, and really seemed to diminish the tinnitus. After the healing of this aperture, a period of about fifteen days, a third eyelet was introduced which remained in situ about one week, causing the same purulent inflammation as has been previously reported. The membrane at the time of this introduction was so sunken that when the eyelet was inserted, the tympanal extremity was somewhat driven into the membrane lining the promontory, so that no air passed through it. By using traction with Siegle's speculum, and readjusting the instrument, air passed through satisfactorily.

The effects of the eyelet were not beneficial in the least. After complete recovery from the untoward results of these operations, paracentesis was done, and has been repeated occasionally, and has resulted in the production of a more comfortable feeling in the ear, and the diminution of the tinnitus more than one half. In this case there still seems indication for doing an occasional puncture, as the relief is always considerable.

At the posterior superior portion of the membrane, where the eyelets were introduced there are two whitish cicatrices.

The mobility of the membrane is nearly normal by inflation or by Seigle's speculum, certainly enough in the posterior superior portion.

The light spot is quite peripheric in the anterior inferior portion of the membrane.

The H. D. was always good; at the present it is w. $\frac{24}{48}''$, voice very nearly normal. It is perhaps interesting to observe that a large amount of operative interference with the drum membrane, and the consequent inflammation, does not necessarily diminish the hearing power.

It is perhaps a more difficult matter to offer a reasonable explanation for the results obtained in these cases, than to have recorded them. In general, it may be inferred that the punctures of the membrane have diminished pressure on the labyrinth water. This pressure comes about in the class of cases under consideration by, —

(A.) A sunken drum membrane, the result of air pressure on the external surface, with little or no compensating pressure on its tympanal surface.

(B.) Shortening of the tendon of the tensor tympani muscle.

(C.) Adhesion between the membrane or the ossicula and the promontory.

(D.) A partial closure of the Eustachian tube, when through a very narrow canal a column of air is forced into the tympanum by the air-bath, producing excessive intra-tympanal pressure, and through the secondary membrane (round window) producing pressure on the labyrinth water.

In the divisions A, B, and C, the pressure on the labyrinth water is through the oval window, by means of the base of the stapes, which may become "impacted" in the oval window.

The explanation of the cause of relief by the punctures, I would give as follows: —

By long continued pressure of the external air on the membrane, it becomes stretched, in order to produce, so to speak, a redundancy of membrane sufficient to result in the more or less deeply cupped shape characteristic of the sunken position. There is in this connection also a loss of elasticity of the membrane, so that when the position is restored by the air-bath (in cases where there is no serious shortening of the tendon of the tensor, or adhesion between the promontory and membrane, or impaction of the base of the stapes in its window), it no longer remains there, but falls inward to its old position when no longer stayed by an excess of intra-aural air pressure.

The puncture seems to result in a minute cicatrix, which, as elsewhere, tends to contraction, and by a repetition of these, a considerable diminution of the superficial area of the membrane is occasioned; at the same time it improves its elasticity. By these combined influences the membrane assumes a less concave position.

In the single case reported of bulging of the membrane, the curvature was outwards instead of in the opposite direc-

tion, and to understand the rationale of the improvement we apply precisely the same reasoning as in the other instances, *i. e.* the diminution of the superficial area of the membrane, and the improvement to its elasticity, cause it to approximate towards the normal position.

The temporary effect on the H. D. and the tinnitus undoubtedly depends on the equalizing of air pressure in the tympanum and the external canal. Theoretically, this operation should have a similar effect to the division of the tensor tympani muscle, which latter operation partakes of the nature of the paracentesis, inasmuch as an opening into the membrane is made, and instead of the overcoming of the shortening of the tensor by putting it on the stretch, as in the paracentesis, it is divided.

This latter operation, however, inflicts so much violence to the ear as to offer a somewhat serious objection to its performance.

SUMMARY.

Number of cases treated	10
Number in which tinnitus was more or less benefited (of this number, two were completely relieved) .	8
Number in which there was no benefit to the tinnitus,	2
	10
Number of cases where the H. D. was more or less benefited	4
Number of cases where there was no benefit to the H. D.	3
Number of cases where the H. D. was so nearly normal as not to admit of much room for benefit .	3
	10
Number of cases where unpleasant intra-aural symptoms were relieved	6
Number of cases where the same were not relieved .	1
Number of cases where there were none of these symptoms	3
	10

Some inflammation and pain resulted from the punctures, twice in one subject and once in another.

In the first (Doherty), leeches were needed in one instance to relieve the pain.

The eyelet was introduced twice each in two patients, and three times in a third, — all in the same membrane of the given patient, — and excited inflammation and discharge in every case, and in three of the seven introductions it was distinctly purulent. The H. D. was not damaged by the eyelet, perhaps, in the least.

The case of Burk, where the eyelet was introduced three times, retained a H. D. so nearly normal for the voice that an ordinary test failed to detect any impairment, although the watch was not heard perfectly.

The eyelets remained in from eight days to twenty-four hours, with the exception of one of them (Schwammer), who pulled one out after a few hours on account of the severe pain.

Many other cases were punctured which are not recorded. Some of these presented too indistinct indications as to the results of the treatment to be recorded, while a few of the others, it must be admitted, were not favorably affected by the punctures.

I am inclined to the belief that paracentesis in this class of cases often helps us along in the treatment, and without imperilling the present state of the patient. It is worthy of remark that in these cases paracentesis was only used after other means had been faithfully tried, and, as the report will show, not altogether unsuccessfully. I make no mention of the removal of "masses of inspissated and dried mucus," as nothing of the kind was found, although perhaps I did not look for it; but after each puncture the patient was directed to perform Valsalva's operation frequently during the first hour or two to remove any blood which might have collected in the tympanic cavity.

The point at which the punctures were made was just behind the short process of the malleus, sufficiently far to avoid

the incus, and as high up as possible, without striking the chorda-tymp. nerve, although that has been pricked once or twice, without, however, doing any harm beyond causing a little pain in the ear, running forwards to the side of the tongue.

The instrument used in the punctures may be a broad cataract needle, as well as anything else, with a tolerably narrow speculum, preferably of the Gruber variety, which may be pointed towards the portion of the membrane to be punctured. An instrument fixed in a handle at a right or an obtuse angle, allows of better inspection of the membrane at the point of puncture, but it is much more awkward to handle, and results in more violence to the membrane.

I prefer pricking the membrane with the straight instrument, giving it a sudden but extremely light thrust, for the patient is pretty certain to move the head at this time A paracentesis of the membrane is extremely unpleasant to the patient, without ordinarily being very painful.

A CASE OF HARDNESS OF HEARING FOR LOW TONES.

BY CHARLES H. BURNETT, M. D., PHILADELPHIA.

During the past winter, a young lady presented herself to me, complaining of hardness of hearing. I examined the membrana tympani of each side, but found no changes in them. The fauces showed no disease, and the Eustachian tubes were pervious. I then tested the hearing with the watch, tuning-fork, and voice. All of these were heard normally, and a whisper was heard twenty feet with greatest ease.

The patient stated that she had never had any disease of the ears, but had always enjoyed very good hearing. I knew that she was an excellent musician. She had suffered some from dyspepsia, but lately that complaint had been relieved. I could detect no hardness of hearing for the

ordinary tests, and told her so, when to my surprise she informed me that it was loud tones and noises which she could not hear distinctly; and she had consulted me, since she feared an extension of the inability to hear to fainter or higher tones.

She first became aware of her deficiency while walking in the fields with her father, for the latter could distinctly hear the thunder of an approaching storm; but the lady, my patient, could hear nothing of that kind. Subsequent to this, she noticed that she could not hear the bass notes of an organ on which she was accustomed to perform, and therefore missed such notes in the chords.

This case seems to demonstrate most forcibly the physiological importance of the higher notes of the scale, so far as conversation and ordinary sounds are concerned, and fits well to those cases illustrative of this importance recently published by Moos. (Archiv für Oph. und Otol., Vol. III, No. 1.) In his cases we find deafness for high notes, and a consequent inability to hear conversation of an ordinary pitch. In my case, the patient possessed hearing for ordinary notes and conversation, because her hardness of hearing was confined to tones of few vibrations per second, indicating, perhaps, an altered function of some of Curti's arches, but more probably an alteration in the position and tension of the sound-conducting apparatus.

It would have been of great interest could I have tested, according to the method suggested by Blake (Trans. of American Otol. Soc., July, 1872), the sensibility of the organ of hearing in this case for very high tones. If in my patient the ability to hear high tones were increased, we might well assume that there was a retraction of the membrana tympani, too slight to be detected by the eye, but enough to render the hearing more acute for high tones and less acute for low tones.

A PECULIAR MANIFESTATION OF THE PARADOXICAL FORMULA IN THE APPLICATION OF THE CONSTANT ELECTRIC CURRENT TO THE RIGHT EAR.

BY CHARLES H. BURNETT, M. D., PHILADELPHIA.

THE peculiar manifestation about to be described, occurred in the case of a large, strong man, forty-five years old, very deaf in the left ear, which was also affected with constant and annoying tinnitus. The right ear was totally deaf and unaffected with tinnitus. The tuning fork was heard by bone-conduction only in the left ear.

We are told by Brenner that in the perfect manifestation of the paradoxical formula, not only the acoustic nerve of the armed ear responds to the electric current, but also the acoustic nerve of the unarmed side responds to the electric current, but in a reversed order.

Hence, in the unarmed ear, acoustic sensations are produced by those elements of excitation, which have no effect upon the armed ear; *i.e.* the unarmed ear acts as if it were under the influence of the other pole. This is the substance of Brenner's definition of the paradoxical formula, and implies a response to the electric current from the acoustic nerve of the armed as well as the unarmed ear. The peculiarity of the case under consideration was *the entire absence of any acoustic reaction whatever in the right ear, i. e. the armed ear.* The formulæ for the two sides, the right ear being armed, were as follows: —

XX, 2,100	KS.	right ear,	o,	L.	Tinnitus	ceases.
	KD.	" "	o,	"	"	"
	KO.	" "	o,	"	"	returns.
	AS.	" "	o,	"	"	continues.
	AD.	" "	o,	"	"	"
	AO.	" "	o,	"	"	ceases.

From these formulæ it is seen that although the acoustic nerve of the armed side did not respond to the electric cur-

rent, the acoustic nerve of the unarmed side responded as if it had been under the influence of the other pole, thus showing that *the paradoxical formula is entirely independent of the reaction in the armed ear.*

Upon reversing the positions of the electrodes in reference to the body, *i. e.* by arming the left ear with an electrode, and placing the other electrode in the right hand, the following formula was obtained for the left ear, with no reaction whatever in the right ear (the unarmed ear).

KS.	tinnitus	ceases.
KD.	"	"
KO.	"	returns.
AS.	"	continues.
AD.	"	"
AO.	"	ceases.

It will be seen at once that in this case we have two points of novel interest.

1. The entire absence of any acoustic reaction in the totally deaf ear while under the electric current.
2. The complete paradoxical formula on the left side.

TYMPANIC TREPHINE.

BY C. H. BURNETT, M. D., PHILADELPHIA.

THE trephine which I have devised is very simple in its structure and use. I am well aware that a trephine for the membrana tympani is of no great novelty, and I merely claim for mine simplicity of structure and application. Its entire length is 7.5 cm., divided into three portions, as follows: 2 cm. are allowed for the portion which fits into the holder; 5 cm. are taken up by the shaft, and the remaining ½ cm. is given to the trephine proper. In some cases this may be ¾ cm. long. The trephine proper is a small, polished, hollow cylinder, 2 mm. in diameter, possessing a smooth, cutting edge. The whole is made to fit into a Weber-Liel tenotome-holder, which is really a modification

of Wreden's myringotome, with a curved handle, for a full description of which the reader is referred to Weber-Liel's paper on the instruments used in tenotomy of the tensor tympani. (Monatsschr. f. O., Jan. 1872.) Its adaptation to this handle gives it the rotary motion so essential to its convenient use.

The shaft of my trephine is a little thicker than that of one of Weber-Liel's tenotomes, but this does not interfere with its usefulness. One of the most celebrated tympanic trephines was that of Fabrizi, an Italian, whose instrument is alluded to and described by Joseph Williams, M. D., in his "Treatise on the Ear," London, 1840.

This instrument was in reality a trocar and canula, — an exceedingly unwieldy instrument for operating upon so delicate an organ as the membrana tympani. The trocar portion of Fabrizi's instrument was armed with a small wire, shaped like a corkscrew, which was first passed through the membrana tympani in order to hold the piece to be excised and ensure its removal. The excision was accomplished by means of the cutting end of the canula. Dr. Williams has not given us any explicit data from which we may determine the success which attended this instrument.

It would appear, however, that since the canula had to be passed down and held upon the membrane until the trocar containing the miniature corkscrew was inserted, great inconvenience to the surgeon, as well as pain to the patient, must have ensued.

The instrument which I offer is very light, convenient, and simple in its structure, and ensures by its rotary motion the ready excision of a round piece of membrana tympani, varying in diameter with that of the trephine. The piece of membrane excised is removed with the trephine; if, however, this should fall from the trephine into the tympanic cavity, its small size and bland character would preclude any injurious effects.

ULCERATION OF THE DEMOID LAYER OF THE MEMBRANA TYMPANI.

BY J. ORNE GREEN, M. D., BOSTON.

ULCERATION of the demoid layer of the membrana tympani as a distinct disease, or rather as a distinct and sole cause of discharge from the ear, is mentioned by Toynbee, and two or three cases are given in his work, although imperfectly described. Keene also, in his late work, speaks of the disease, but most of the other modern writers do not mention it at all, or only as an accidental concomitant of other and more important diseases. All who have seen much of aural disease are undoubtedly familiar with ulceration of the demoid as well as the other layers of the membrane in the cases of polypoid degeneration of the membrana tympani as seen in scrofulous children, in the cases of long-continued suppuration, either of the meatus or of the tympanum, and likewise as the result of polypi; but slight and superficial ulceration of the demoid layer alone without the development of granulations or other abnormal condition as the only source of well-marked and long-continued otorrhœa, have been, in my experience, very rare. The following two are the only cases I have ever seen.

Toynbee and Keene both speak of the disease as rare, and as the result of catarrhal inflammation; in both of my cases there had been previous inflammation of some kind in the ear, which it is probable originally caused the ulceration. Toynbee advises for local treatment the use of gentle astringents without specifying which ones are best. Keene advises the use of pulverized talc. In the treatment of my cases, I found the ulceration by no means inclined to act kindly; although several astringents were tried, — nitrate of silver, in solution and solid, pulverized alum, pulverized sulphate of copper, — none of these were as effectual as simply rubbing the surface every four or five days with a stick of sulphate of copper, and keeping the ear clean by

syringing; the stronger applications actually enlarged the surface of the ulcer.

The second case shows the necessity of most carefully cleansing and drying the meatus before examination; till that was done the ulcer in the second case wholly escaped observation. The long continuance of the disease in both cases, twelve years and nine months, respectively, shows a complete lack of the "vis medicatrix naturæ."

Mrs. L., aged twenty-five, in good health, but not a robust person. Parents perfectly healthy, but all of her brothers and sisters have disease of the ears. Two of them had been under my care; one brother with destruction of both drum-membranes and polypoid granulations in the tympana, and a sister with perforation of the drum membrane and polypoid granulations on one side, and quite extreme plastic inflammation on the other: both had decided nasal catarrh.

In childhood Mrs. L. had suffered a few times from earache, but none of these attacks had been followed by otorrhœa. Some twelve years ago, however, without known cause, a very slight offensive discharge had begun from the right ear, and had continued constantly ever since, obliging her to syringe the ear daily with warm water. Till recently there had been no other symptom. During the three months preceding my visit she had twice had severe pain in both ears, lasting for four or five days, and since these attacks the discharge had been more profuse in the right ear.

After syringing and carefully drying the meatus, I found a superficial ulceration below the manubrium, on the surface of the drum membrane, oval, covering nearly the whole lower third of the membrane, and with an irregular surface which bled readily on being touched. The other parts of the membrane were slightly opaque from swelling. The reflex was a little smaller than normal; the membrane itself in good position and without any perforation. By Valsalva's inflation, the entrance of the air was felt and heard equally in the two ears, but the membrane of the diseased ear moved

less freely than the other. Left ear appeared normal. W. r. $\frac{20}{60}$: l. $\frac{42}{60}$; V. r. $\frac{18}{24}$; l. $\frac{}{24}$.

The ulceration was thoroughly dried with charpie and then touched with solid sulphate of copper, and she was directed to syringe it daily and use an instillation of sulphate of zinc gr. ij. ad. ℥j. The ulceration healed slowly but steadily under the stimulus of the copper, but the healing process ceased when this was omitted, or when the nitrate of silver, either in stick or solution, was substituted. At the end of four weeks a bridge of sound epidermis had formed across the centre of the ulceration, dividing it into two. At the end of seven weeks these were healed, the discharge had ceased, and two reddish swellings occupied the position of the ulcerations. One month after this the drum membrane showed only a slight thickening of its mucous lay; all the swelling had disappeared. W. r. $\frac{36}{60}$: l. $\frac{42}{60}$; V. r. : and l: normal.

More than a year afterwards I had an opportunity of examining the ear again. During that time it had remained well, and the appearances were the same as at the last report.

Mr. W., aged forty, in perfect health, had never had any ear disease till nine months ago, when, as he says, he had two abscesses in the left ear, followed by otorrhœa for a few days, and since then had had "scabs" form in the left meatus, which he had been in the habit of removing with a pin. The day before I saw him, in attempting such a removal, he hurt himself very much, and this was followed by a severe earache which kept him awake all night. I found the drum membrane and meatus intensely congested, and ordered three leeches applied, which reduced the congestion. Examination then showed no otorrhœa, nor could I see any cause for the dried discharge of which he complained. Some ten days after, I found the lower wall of the meatus covered with a thin layer of dried matter, beneath which was a slight congestion, but no rupture of the epidermis; on very carefully wiping out the angle near the drum membrane, however, I saw a narrow, superficial ulceration, partly on the lower wall of the meatus and extending about half a line

on to the drum membrane. From the surface of this, pus could be seen to exude; neither with a Bowman's probe or by inflation, could any perforation be found. W. r. $\frac{60}{60}$: l. $\frac{18}{60}$.

This ulceration was treated like the preceding with a similar result. Under the sulphate of copper it improved rapidly, but enlarged again when I tried the nitrate of silver. After two weeks, a bridge of epidermis had formed across the centre, and the healing was progressing finely, when the patient was obliged to sail for Europe. As all instillations caused severe vertigo, I advised him, during his absence, only to keep the ear clean by soaking with warm water and by occasional syringing.

On his return, three months afterwards, the ulceration was almost healed, and the "scabs," which had usually formed in four or five days, then required as many weeks for their development.

The same treatment was continued, and in another month the ulceration had healed, the discharge had ceased, and the hearing was W. l. $\frac{30}{60}$; a marked congestion still remained at the seat of ulceration, and the whole mucous layer of the membrana tympani had become irregularly thickened.

REACTION OF THE AUDITORY NERVE UNDER THE GALVANIC CURRENT.

BY CLARENCE J. BLAKE, M. D., BOSTON.

The experiments of which the observations noted in the following paper are the result, were undertaken with the view of determining, if possible, some other symptoms of the reaction of the auditory nerve to the galvanic current than those laid down by Brenner, experience having shown that the formulæ given by this author are not always obtainable. In all of the tests, extending over a period of between two and three years, and including numerous cases, an attempt was first made to obtain some one of the formulæ of Brenner; failing in this the effect of the galvanic current

upon the auditory nerve was then tested in the manner hereafter described.[1]

In all cases the simple hard carbon electrodes were used, one being applied in front of the tragus and the other held in the hand of the opposite side; this being preferable to the internal method of electrization, for obvious reasons.

The first series of tests were made to ascertain the effect of the current upon the perception of high musical tones. The cathode being applied in front of the ear to be tested, and the anode held in the hand of the opposite side, and the current gradually increased, the perception for high musical tones was found to increase in various cases from three thousand to five and seven thousand vibrations in the second above the limit of hearing before the application of the current. This increased limit of perception continued during the duration of, and for a short time, from thirty seconds to two minutes after the opening of the cathode, but was speedily diminished by a reversal of the current. The use of the cathode only seemed to have this effect of increasing the limit of perception; the opposite pole, however, did not correspondingly diminish the hearing for high musical tones.

For the production of high tones the König's rods, described in the transactions of this society at its last meeting, were used, the rods being suspended by means of fine wire at a uniform distance (three inches) from the ear tested, and set in vibration by a blow from a steel hammer. The result in the increased limit of perception under the action of a stimulant current, agreeing with the observations of Ritter, that on passing a direct continuous current through his own ears, the sound of a tuning-fork G, gradually increased in pitch with the increase in intensity of the current.

---

[1] That the formulæ of Brenner were not given in many cases, is probably due to the fact that the rheostate was omitted, and the current from a Stöhrer battery passed directly without resistances. A further series of controlling experiments with the rheostate, will show more justly the proportion of cases in which Brenner's formulæ are obtainable, and will, I hope, confirm the observations given in this paper.

The cathode being applied in front of the ear, as in the previous experiment, we find, moreover, that the passage of the galvanic current *increases not only the limit of perception of musical tones, but also the intensity of perception; the degree of increase, in intensity of perception, being a measure of the degree in which the auditory nerve responds to the stimulus.*

In establishing this observation, experiments were first made in cases of normal hearing, and later in cases of diminished hearing, resulting from disease of the middle ear, or without visible cause. In all cases a Stöhrer battery without the rheostate was employed, and the electrodes applied, the cathode in front of the ear and the anode to the hand of the opposite side. As a sound source a tuning-fork A, 562 v. s. was used, the fork being set in vibration by a blow from a spring hammer, striking with a force equivalent to one pound falling one inch, thus ensuring uniform intensity of vibration, — the normal duration of hearing of this instrument, held at a distance of six inches from the ear, being from fifty-five to sixty seconds.

The tuning-fork set in vibration was first held opposite the ear to be tested, and the length of time during which the tone was heard noted; the same test was repeated under the stimulus of the galvanic current, and the increase in the duration of the perception also noted. As a result of a series of these tests it was found, that in the healthy ear, on the average, the increase is from one twelfth to one sixth of the normal duration of perception, and that this proportion diminishes in accordance with the diminished reactive power of the auditory nerve.

In those cases of chronic catarrhal inflammation of the middle ear in which the perceptive power was but slightly diminished, and where there was decided tinnitus aurium, this latter symptom was made available for the third series of tests. As a result of the progressive changes within the middle ear, there is with the pressure of the membrana tympani and ossicula inward evidence of the effect of this pres-

sure, and the accompanying irritation of the auditory nerve in the occurrence of subjective noises, noticed at first occasionally, and finally becoming constant and increasing with the progress of the disease in the middle ear. In many of these cases it may be impossible to obtain a positive reaction according to the formulæ of Brenner; but we may be guided in the application of the current by the results of the tests already described, and in addition by the effect which the current has upon the tinnitus aurium. In other words, this symptom may be made available for the purpose of determining the character of the current to be employed in treatment, its first application of course being purely experimental.

The hearing distance having been carefully tested by means of a test watch, the limit of perception for high musical tones by means of König's rods, the duration of perception by means of the tuning-fork, and the patient's attention drawn to the degree of the tinnitus aurium, the cathode may be first applied in front of the ear and then the anode of equal strength and for the same length of time, the hearing being again carefully tested during and after the passage of either current, and any changes in the character or intensity of the tinnitus aurium noted.

It will be found as a rule, *that the current which diminishes the tinnitus aurium increases the hearing, and that the current which increases the tinnitus diminishes the hearing. In cases where the tinnitus is diminished without increase of the hearing, this effect is usually produced by the use of the anode, the cathode increasing the tinnitus, without a corresponding increase of hearing. When the hearing is increased, together with an increase of the tinnitus, this result is usually obtained with the use of the cathode.*

In the use of the galvanic current in the treatment of these cases as based upon the above tests, we should be guided by the result of the experimental application; the current to be employed being the one which increases the hearing and diminishes the tinnitus, or in default of this double effect,

the current which increases the hearing, even at the expense of increasing the tinnitus, experience showing that the tinnitus, though temporarily increased, gradually subsides and diminishes with the improvement of hearing at subsequent applications of electricity.

The following case may be selected as an illustration of this latter point: —

The patient was a man in robust health, twenty-one years of age; the hearing had been gradually but noticeably diminishing for more than three years, and during that time there had been a constant rushing sound in both ears; this sound did not vary materially with change of climate, weather, or condition. The membrana tympani of both ears was concave, opaque, and of a dull-gray color. The use of the air douche and catheter did not improve the hearing, which was $\frac{13}{72}$ in the right ear, and $\frac{24}{72}$ in the left ear, as tested by the watch.

The perception through the bones of the head, for the watch, was better in the left ear, and for the tuning-fork better in the right ear, but diminished in both.

The current from a Stöhrer battery was applied without obtaining formula of reaction; the use of the anode neither diminished the tinnitus aurium nor improved the hearing; the use of the cathode increased the tinnitus aurium and also improved the hearing. The use of the cathode was therefore continued at intervals of two days, and after the third application the hearing, tested by the watch, had increased to $\frac{41}{72}$ in the right ear, and $\frac{3}{72}$ in the left ear, accompanied by a sensible diminution of the tinnitus aurium.

DIAGNOSTIC VALUE OF HIGH MUSICAL TONES.

BY CLARENCE J. BLAKE, M. D., BOSTON.

A CONTINUATION of the experiments on the perception of high musical tones, published in the transactions of the American Otological Society for last year, gave the results briefly stated in the following paper.

The instrument used in the experiments consisted of a series of König's rods, ranging from a tone of 20,000 v. s. to one of 100,000 v. s., with intervals of 5,000 v. s.; and for controlling experiments a second series of rods, comprising three octaves of the musical scale from a tone of 8,000 v. s. upwards.

The method pursued consisted first, in a careful examination of the ear to be tested by means of the speculum, and tests of the hearing with the voice, watch, and tuning-fork; and second, in the tests with the rods, which were suspended in succession at a distance of three inches from the ear and set in vibration by a blow from a steel hammer swinging through an arc of 90°.

Any claim which the tests with high musical tones may have to value in diagnosis may be based upon the following facts: That the limit of perceptive power of the cochlea exceeds the limit of sound-transmitting power of the structures of the middle ear in their normal condition; that the structures of the middle ear in their normal condition, therefore, present a barrier, as it were, to the passage of sonorous vibrations above a given point; and that the perceptive power of the internal ear remaining the same, morbid changes in the middle ear result in a variation in the limit of their transmission of musical tones. This variation may be either above or below a certain limit, which may be considered as the standard of transmitting power of the middle ear in a normal condition. To determine this latter point, tests with König's rods were made in a number of healthy ears; that is to say, in ears presenting a normal appearance on examination, and answering normally to the usual tests for hearing, with a result, given in a former paper, of an average limit of about 40,000 v. s. To determine approximately the limit of perceptive power of the internal ear, and also the influence of the membrana tympani in preventing the transmission of tones above a certain number of vibrations, the following experiment was made in several cases, the most noticeable result being given in the case cited, in which

the hearing for both watch and voice in the ordinary tone of conversation was diminished to $\frac{1}{72}$ for the former and six feet for the latter, the membrana tympani being very concave, of a dull-gray color, and having calcareous deposits three in number and each about $\frac{1}{2}$ m. m. in diameter in the posterior segment. A tone of 35,000 v. s. was heard with difficulty; the middle ear could be easily inflated, but without improvement in hearing. A piece of the membrana tympani, 2 m. m. in diameter, was removed from the posterior inferior segment. Immediately after the operation the hearing for both watch and voice increased, and a tone of 100,000 v. s. was distinctly heard.

To avoid any possibility of error, the patient was blindfolded, and the König's rods held in such a manner as to prevent free vibration, but in each case the patient was able to distinguish between the sound made by the impact of the hammer and the metallic ring of the steel rod. This perforation remained open for ten days, during which time the hearing gradually diminished to 85,000 v. s.; on the final closure of the opening by a tense cicatrix the hearing still further diminished, but the same result in the hearing of the higher tones followed two subsequent experiments, in the same case. In other patients on whom the same experiment was made, the hearing increased to tones of 80,000 v. s., and 85,000 v. s. in still others, notably those in which there was considerable thickening of the mucous membrane, it did not exceed a tone of 65,000 v. s. The difference between a tone of 100,000 v. s., or possibly of any higher tone which may be heard on subsequent experiments, and the tone which is heard in the majority of cases where the ear is in a normal condition, may be taken as the measure of the degree of resistance, so to speak, which the structures of the normal middle ear present to the passage of the short sound waves of the higher musical tones.

Any diminution or increase of the hearing for high musical tones below or above the certain limit which is considered the normal one, becomes, therefore, evidence of increase

or diminution of this resistance; provided, however, that the perceptive power of the cochlea remains the same. Supposing, in any case, this power to remain constant, an increased perception for high musical tones would imply a change in the structures of the middle ear sufficient to enable them to vibrate in response to shorter sound waves. The degree of tension and the consequent responsive power to higher tones of the various structures of the middle ear increases from the membrana tympani inward as shown by the experiments of Mach and Kessel, and of Burnett. We should expect, therefore, that the hearing for high tones would increase with increased tension of the membrana tympani for instance, or with elimination of the membrana tympani, the sound waves being allowed to pass directly into the middle ear. In two cases of voluntary contraction of the musc. tensor tympani, both possessed of normal hearing, the hearing for high tones was increased in one case 3,000 v. s., and in the other 5,000 v. s., during the contraction of the muscle, the same result being obtained in cases in which contraction of the muscle was artificially induced. And also in cases of acute or chronic catarrhal inflammation of the middle ear in which the tension of the membrana tympani was due to a preponderance of atmospheric pressure from without, or caused by a secondary contraction of the musc. tensor tympani in consequence of long-continued catarrhal trouble. Where the substance of the membrane was irregularly thickened by changes in the mucous membrane, or by presence of calcareous deposit, or where it was artificially loaded for purposes of experiment, this increase in hearing for high musical tones did not occur. The same observation applies to those cases in which there were adhesions of the membrana tympani, or synechiæ in the middle ear, with this exception, that when the membrana tympani was in contact with the lower portion of the descending process of the incus the hearing for high tones was increased. Of several cases observed, two especially may be cited; in both the hearing for the voice and watch was nearly normal, and the

hearing for high tones reached 65,000 v. s.; in one case the membrana tympani had become firmly adherent to the descending process of the incus throughout its lower third in consequence of a rupture of the membrane at that point. In the other, a tense cicatrix extended from the edges of a former perforation to the end of the processus longus.

In anomalies of tension of the membrana tympani the König's rods may be used to obtain an approximate measurement of the degree of tension, and still further, to determine the sound-transmitting condition of the deeper-seated parts.

The increased limit of hearing for high musical tones in cases of increased tension of the membrana tympani implying a comparatively normal condition of the structures about the base of the stapes and the fenestra rotunda; this may furthermore be readily tested by eliminating the membrana tympani by the simple expedient of a perforation with a paracentesis needle. A review of the tests made in cases of perforation of the membrana tympani, shows the effect which the condition of the mucous membrane of the middle ear, for instance, may have upon the hearing for high musical tones.

The highest limit of hearing was obtained after artificial perforation, cases being selected in which it was advisable to make the test, and in which the middle ear was in a comparatively healthy condition. The opening was usually made in the posterior inferior segment by the formation of a triangular flap, of sufficient size, on being pushed inward with a probe, to give an opportunity of examining the middle ear, but which on springing back into place would heal readily, with very little variation of the contour of the membrane. The increase in hearing in such cases varied from 35,000 v. s. to 60,000 v. s. above the normal standard. The next highest limit of hearing was found in cases of perforation, the original disease having subsided and the otorrhœa having ceased; here the increase varied from 20,000 v. s. to 45,000 v. s. above the normal standard, the higher limit being found in cases in which the inflammatory process had

been of short duration and had recently terminated, continued exposure of the mucous membrane and the consequent changes seeming to have the effect of diminishing the hearing.

The limit of hearing for high tones steadily diminished in cases of purulent inflammation of the middle ear in proportion to the increased congestion and thickening of the mucous membrane; sometimes it was even below the normal standard.

In one case, that of a large perforation, the purulent inflammation having subsided and the mucous membrane being white and transparent, the hearing for high tones reached 65,000 v. s.; on the application of an irritant the membrane became congested and swollen and the hearing diminished to 40,000 v. s.

Aside from the very interesting field for experiment which is opened by tests with high musical tones, the steel rods may be made of immediate value in aural practice by affording a controlling test of the sound-transmitting power of the structures of the middle ear; and also, as shown in the preceding paper, of the reactive condition of the auditory nerve.

So far as the sound-transmitting apparatus of the ear is concerned, they are of value in determining how far morbid changes may have affected the more delicate functional activity of these parts, and by their use we may be led to detect alterations which would not be appreciable by examination or by other tests.

DEFORMITY OF THE AURICLE, RESULTING FROM INFLAMMATION OF THE EXTERNAL AUDITORY CANAL.

BY D. B. ST. JOHN ROOSA, M. D.

Mrs. E. X., aged about forty, consulted me on the 22d of December, 1871, and gave the following history. Six weeks ago she had a severe pain in the left ear, for which she applied a poultice to the part. The pain subsided some-

what, when she consulted Dr. J. Orne Green, who made an incision into the auditory canal. The patient remained under Dr. Green's care until December 16th, from November 13th. When she last saw Dr. Green he advised that a poultice be kept on the ear for a *short time*, but it had been applied for the greater part of the six days since her last visit. The ear now feels to her very much blocked up, and there is considerable uneasiness and pain in it.

Dr. Green's account of the case up to this point is as follows: "Mrs. X. applied to me on November 13th, with a diffuse inflammation of the meatus, of one week's standing. There was then nothing marked in the case; the swelling was greatest about the middle of the meatus, closing the passage there. There was not much swelling externally. During that week she had a furuncle on one eyelid, and when seen was suffering from inflammation of one ala of the nose. There was deafness, relieved, however, by pressing the swelling back a little. I tried pressure by a wad of charpie, and ordered a horseshoe poultice around the ear. The swelling softened, but not going down, I made an incision nearly the whole length of the meatus, which relieved pain and evacuated a little pus. The patient was ordered to use Clarke's douche. The redness of the meatus, which had been marked, diminished, and she seemed to be doing well for three days or so, when the ear began to swell again, and there was a return of all the old symptoms. Leeches were used, warm-water poultices, and the douche. Another thorough incision was made, evacuating a little pus and causing slight relief; the swelling, however, again returned, but it was so far external as to be less painful, and I thought that was the last of it; and as she was very anxious to get to New York, I told her she might go, but if the ear troubled her to see you. Another stye formed on one eye, while Mrs. X. was under my care. The case was in my experience unusually obstinate. The patient also took quinine."

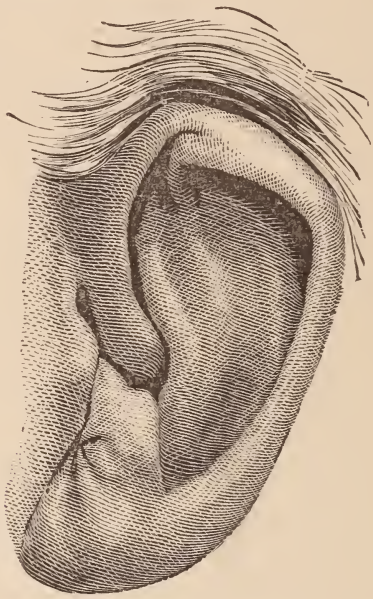
As has been said, six days having elapsed since the last visit of Mrs. X. to Dr. Green, and she having in the mean

time continued to poultice the ear constantly, she consulted me, when I found the auricle somewhat reddened, and the whole meatus occluded by a fungous-looking growth springing from the middle of the anterior wall of the auditory canal. I removed this by a snare, and applied nitric acid to the base, and ordered the warm douche to be continued. The patient's general condition was not good. She was very anxious, did not sleep well, but no organic disease was detected. Tonics were continued. The fungous growth continued to sprout after the removal, and I was obliged to remove portions from time to time; but the case showed no peculiar features except those of exceptional obstinacy and the illy-defined, bad general condition of the patient, until about Jan. 22d, when the whole auricle became very red, swelled, and tender. The patient slept badly, and anodynes and local applications gave only partial relief. There was so much swelling and fluctuation of various parts of the auricle, especially in the concha, that I felt obliged to make incisions in the part at various times. A bloody serum was evacuated, but no pus.

On February 12th, the canal had thoroughly healed, but the auricle was still swelled, red, painful, and tender, and the natural features of the part, except the helix, were removed by this swelling, so that the ear was considerably deformed. The meatus was but a minute opening, but when the walls were drawn apart the hearing was found to be unimpaired. The membrana tympani was never affected during the whole course of the trouble.

In this condition Mrs. X. returned to Boston, and put herself under the care of Dr. Henry L. Shaw. Dr. Shaw used an ointment of the oxide of zinc, but the swelling increased, and at "the back of the ear" it showed a tendency to point, when Dr. Shaw made an incision with a Græfe's knife "from the back directly through into the swelling of the concha, and got out a few drops only of pus. The cut healed and again pointed, and was again incised; there was, however, only a sign of pus." The ear was comparatively

free from pain until April 3, when the pain returned; the bichloride of mercury was applied, and large cul-de-sacs containing serum and pus arose. Various constitutional remedies were given by Dr. Shaw, but none seemed to have much effect. The openings finally healed, the auricle ceased to be red, sensitive, and painful, and the resulting appearance was that described in the accompanying wood-cut, which was made for my treatise on the ear, from a photograph procured by Dr. Shaw.



The patient, as she informs me, immediately after the recovery from the affection of the ear, was attacked by acute articular rheumatism, followed by fever; but she finally recovered, and is in the enjoyment of good health.

The following points seem to me of interest in this case:

1. The prolonged poulticing was the probable cause of the fungous growth.

2. The extension of the inflammation of the auditory canal to the cartilage and perichondrium of the auricle, is rather unusual. The integument of the auricle, however, as

well as that of the temple, is generally involved in any very severe inflammation of the canal; but it is very exceptionally, so far as my experience goes, that the cartilage and perichondrium are involved. The removal of the polypus, which was urgently required, for it sprouted from the meatus, may have had some effect in causing the severe reaction; that is to say, the violence used by the snare and scissors may have materially favored the extension of the inflammatory action to the parts beneath the integument.

3. The patient's general condition was probably the exciting cause of the styes, and the inflammation of the outer ear. There is something very peculiar in the relations between any disturbance of the general nutrition and the tissue of the external auditory canal. Thus we usually find furuncles of the ear in persons who are not in very good health, especially in that condition of the system that results from overwork, or from keeping irregular and late hours.

The peculiar reaction upon the auricle of an affection of the nervous system, is seen in the occurrence of vascular tumors — othæmatomata — in the insane. Brown-Sequard[1] has also observed that pinching the sciatic nerve, by reflex action upon the medulla oblongata, will produce flushing of the ear. Excitable persons, as is well known, flush up to their ears from any sudden mental disturbance, and I have reason to believe that vascular or even nervous affections of the base of the brain are often reflected upon the auricle. I am inclined to think that a much more intimate connection than has hitherto been suspected, will yet be found to exist between diseases of the nerve centres and those of the external ear.[2]

---

[1] Roosa on the Ear, p. 112.

[2] A bare outline of this case was published in another place, but this is the first full account that has been published.

DEAFNESS IN CONSEQUENCE OF EPIDEMIC CEREBRO-SPINAL MENINGITIS.

BY H. KNAPP, M. D., OF NEW YORK.

FROM April 1, 1872, to June 1, 1873, I have observed eighty-five cases of blindness or deafness as the consequence of epidemic cerebro-spinal meningitis. The patients were mostly children under ten years of age, a few only were between ten and twenty. Among the eighty-five cases there were seventy-one of deafness, and only fourteen of blindness. The deafness was on both sides, in all cases; the blindness on both sides in two, and on one side in twelve cases. One patient was blind in one eye and deaf in both ears.

The deafness or blindness was, in most cases, first noticed during the first or second week of the fever; in rare cases the deafness set in during the mostly protracted period of convalescence and exceptionably even so late as six months after the beginning of the cerebro-spinal inflammation. In these latter cases, however, some hardness of hearing was observed when the patients had so far recovered that their hearing could be tested. The hardness of hearing then increased slowly, and terminated in complete deafness within some weeks or months. In the majority of cases the patients were found to be totally deaf when they recovered their consciousness.

In many cases which I had an opportunity to examine, either during the febrile stage of the disease, or during the period of convalescence, I found symptoms of hyperæmia, or catarrhal inflammation of the middle ear, together with congestion of the pharynx. These catarrhal symptoms subsided; whereas the hearing when once lost did not return, and when it was found impaired on the first examination, it went on diminishing to total deafness, while the patients

otherwise regained their full health. A few patients showed symptoms of hyperæsthesia of the acoustic nerves. They complained that noises around them were louder than natural, and often very harsh, shrill, and disagreeable One patient, for instance, complained in this way of the song of a canary-bird. Only a few times have I seen purulent otitis media; and then, on further inquiry, I learned that the patients had had otorrhœa before. Treatment, persistent steaming, also produced otorrhœa in the third month of one case, where previously no symptoms of purulent inflammation of the drum were present.

The prognosis of the deafness consequent on epidemic cerebro-spinal meningitis, is, as far as my own experience teaches me, hopelessly unfavorable. None of the patients who came under my care recovered their hearing when it had once been lost. I am aware, however, that many physicians have noticed impairment of hearing during and after cerebro-spinal fever disappear again. I, of course, do not doubt the correctness of these statements. Milder affections of the auditory organ which impair its function only temporarily, may certainly occur in cerebro-spinal meningitis just as well as in typhoid fever and other grave diseases. Not long ago I was called by a physician to see a child just recovering from cerebro-spinal meningitis, whom he supposed to be blind in both eyes. The child, a girl of five years of age, was really blind, as she could not see any object, nor did her eyes follow a candle passed before them. She was in perfect possession of her senses, and answered questions quick and sensibly. Her pupils, however, were fully responsive to light, and her eyes had not the habitus of that peculiar affection which fatally strikes so many eyes in cerebro-spinal and some pyæmic fevers. On ophthalmoscopic examination I found the media clear, and nothing in the fundus but marked anæmia of the retina. I felt confident that this girl, when going to live, would recover her sight.

This leads me to the *nature* of the ear affection which produces deafness in cerebro-spinal meningitis. There may be anæmia of the labyrinth in some rare cases, causing temporary impairment of hearing; there are cases of inflammation of the middle ear, leading to recovery; but such affections are accidental complications of the general disease; the affection that ends in total and irrecoverable loss of hearing which we notice so frequently — in about ten per cent of our latest epidemic — is an *essential symptom, a homogeneous extension of the original morbid process*, namely a *suppurative inflammation in the labyrinth.* It ranks in the same line with the purulent choroiditis, and the inflammation of different joints which we find so often in cerebro-spinal meningitis. Some weeks ago a patient of about ten years (not included in the eighty-five cases) was brought to me who had just recovered from a typical form of cerebro-spinal meningitis. He was deaf on both sides, blind from purulent choroiditis in the left eye, and had had severe inflammation of his right hip, knee, and ankle joints. Some autopsies are on record, by Lucae and Heller, which demonstrate that the ear affection under consideration was caused by a suppuration in the labyrinth. I owe to the kindness of Dr. Steurer, of New York, the possession of two temporal bones, and the history of a patient who had become deaf, and had died from cerebro-spinal meningitis. I examined the outer and middle ears of this specimen minutely, and found them normal in every particular. One acoustic nerve was softened by suppuration, whereas the accompanying facial appeared normal. The other acoustic nerve had not suffered, but numerous pus cells were found around it in the inner auditory canal. The petrous portions of these two temporal bones are now lying in a solution of chromic acid. As soon as they are decalcified I shall endeavor to examine carefully the parts of the labyrinth.

In regard to therapeutics, I fear that this essential form of ear disease which we find in cerebro-spinal meningitis, is

not amenable to treatment when the deafness is complete and has lasted weeks or months. Accidental complications, exudative processes, hyperæmia, and anæmia may be successfully treated by the antiphlogistic method and by the constant current. The latter I would always recommend when there is a trace of hearing left, and general debility and anæmia are marked.

TRANSACTIONS

OF THE

AMERICAN OTOLOGICAL SOCIETY.

SEVENTH ANNUAL MEETING.

NEWPORT, R. I., JULY 15, 1874.

FOR SALE BY
JAMES CAMPBELL, 18 TREMONT STREET, BOSTON.
1874.

CONTENTS.

	PAGE
Members of the Society	457
Minutes of the Seventh Annual Meeting	459
Report on Otology. By C. H. Burnett, M.D., Phila., and C. J. Blake, M.D., Boston.	461
Ultimate Forms of Granulation Tissue in the Ear. By A. H. Buck, M.D., New York	534
A Case of Otitis Media Purulenta, with Sinus opening into the Pharynx. By A. Mathewson, M.D., Brooklyn	539
A Case of Aural Polypus, having a Cartilaginous and Osseous Base. By O. D. Pomeroy, M.D., New York	541
Mechanical Value of the Distribution of Weight in the Ossicula. By C. J. Blake, M.D., Boston	543
Perforations of the Membrane of Shrapnel in Purulent Inflammation of the Middle Ear. By C. J. Blake, M.D., Boston	546
Chronic Discharge from the Tympanum, with Perforation of the Membrana Flaccida, posteriorly. By C. H. Burnett, M.D., Philadelphia	553
A Case of Irritation of the Chorda Tympani; Paralysis of the Facial; Polypoid Growths on the Membrana Tympani. By H. D. Noyes, M.D., New York	556
Neuralgia in and about the Ear. By J. Orne Green, M.D., Boston	561
A Case of Chronic Suppurative Inflammation of the Middle Ear, terminating fatally. By David Webster, M.D., New York	572
Tenotomy of the Tensor Tympani Muscle, done posteriorly to the Malleus. By O. D. Pomeroy, M.D., New York	577
A Case of so-called Ménière's Disease. By C. H. Burnett, M.D., Philadelphia	583
Index to Volume I	584

MEMBERS OF THE AMERICAN OTOLOGICAL SOCIETY.

Dr. Frank W. Abbott	Buffalo, N. Y.
Dr. C. R. Agnew	New York City.
Dr. Rob't M. Bertholet	Philadelphia, Pa.
Dr C. J. Blake	Boston, Mass.
Dr. A. H. Buck	New York City.
Dr. Chas. H. Burnett	Philadelphia, Pa.
Dr. J. Solis Cohen	Philadelphia, Pa.
Dr. John H. Dix	Boston, Mass.
Dr. Ezra Dyer	Pittsburg, Pa.
Dr John Green	St. Louis, Mo.
Dr. J. Orne Green	Boston, Mass.
Dr. Chas. E. Hackley	New York City.
Dr. J. H. Hinton	New York City.
Dr. E. L. Holmes	Chicago, Ill.
Dr. Chas. J. Kipp	Newark, N. J.
Dr. H. Knapp	New York City.
Dr. Wm. S. Ludlum	New York City.
Dr. Arthur Mathewson	Brooklyn, N. Y.
Dr. C. S. Merrill	Albany, N. Y.
Dr. W. W. Morland	Boston, Mass.
Dr. H. G. Newton	Brooklyn, N. Y.
Dr. Henry D. Noyes	New York City.
Dr. J. F. Noyes	Detroit, Mich.
Dr. Charles I. Pardee	New York City.
Dr. Howard Pinkney	New York City.
Dr. George B. Pomeroy	New York City.
Dr. O. D. Pomeroy	New York City.
Dr. Thomas R. Pooley	New York City.
Dr. J. S. Prout	Brooklyn, N. Y.
Dr. C. E. Rider	Rochester, N. Y.
Dr. C. A. Robertson	Albany, N. Y.
Dr. D. B. St. J. Roosa	New York City.
Dr. W. W. Seeley	Cincinnati, O.
Dr. Samuel Sexton	New York City.
Dr. H. L. Shaw	Boston, Mass.
Dr. Francis Simrock	New York City.
Dr. H. N. Spencer	St. Louis, Mo.
Dr. George Strawbridge	Philadelphia, Pa.
Dr. Wm. Thomson	Philadelphia, Pa.
Dr. David Webster	New York City.
Dr. Robert Willard	Boston, Mass.
Dr. E. Williams	Cincinnati, O.
Total	42.

THE AMERICAN OTOLOGICAL SOCIETY.

MINUTES FOR 1874.

NEWPORT, R. I., July 15, 1874.

The Seventh Annual Meeting of the Society was opened at the Aquidneck House, at 10¾ o'clock, A. M., the Vice-President, Dr. C. J. Blake, in the chair.

Present: —

DR. C. J. BLAKE, Boston.
DR. C. E. RIDER, Rochester, N. Y.
DR. H. D. NOYES, New York.
DR. A. H. BUCK, New York.
DR. C. R. AGNEW, New York.
DR. O. D. POMEROY, New York.
DR. J. S. PROUT, Brooklyn.
DR. A. MATHEWSON, Brooklyn.
DR. J. F. NOYES, Detroit.
DR. C. H. BURNETT, Philadelphia.
DR. J. GREEN, St. Louis.
DR E. DYER, Pittsburg, Pa.
DR. J. O. GREEN, Boston.

And by invitation, —

DRS. DIXON AND ARNOLD.

The Vice-President, in a few introductory remarks, expressed the regrets of the President at his absence, and then appointed, as the Executive Committee, Drs. H. D. Noyes, Pomeroy, and John Green.

The Treasurer's report was read, and referred to Dr. Buck as an Auditing Committee, who reported it correctly cast and properly vouched. On motion, it was then accepted.

The Executive Committee reported the nomination of Dr. Ezra Dyer, of Pittsburg, as a member, and on ballot he was elected. The same committee reported a bulletin of papers, which were then read in order and referred to the Publishing Committee.

The thanks of the Society were given Drs. Burnett and Blake for the very satisfactory manner in which they had performed their duties as the Committee on Otology; and it was voted that one hundred extra copies of the report be given to these gentlemen.

After the reading of the second paper, at $1\frac{3}{4}$ o'clock, the Society adjourned till 4 o'clock.

Second Session.

The Society was called to order at $4\frac{1}{4}$ o'clock, by the Vice-President, and the minutes of the first session were read and approved.

The nomination of Dr. C. S. Merrill, of Albany, was received from the Executive Committee, and on ballot he was elected.

The reading of the papers was then concluded.

Dr. Rider announced the death of Dr. J. W. Lawton, of Syracuse, N. Y., and gave a short account of his life and last illness. The Secretary was instructed to enter in the records the time and circumstances of Dr. Lawton's death.

It was voted that the Publishing Committee revise the Constitution and By-Laws, and submit their report at the next meeting.

The Executive Committee nominated the following list of officers for the ensuing year, and they were duly elected: —

President, D. B. St. John Roosa, M. D.
Vice-President, Clarence J. Blake, M. D.
Secretary and Treasurer, J. Orne Green, M. D.
Committee on Otology, { Clarence J. Blake, M. D.
Arthur Mathewson, M. D.
Publishing Committee, { J. Orne Green, M. D.
J. S. Prout, M. D.
H. G. Newton, M. D.

The Secretary was instructed to send a list of the members, with their residences, to each member of the Society.

The resignation of Dr. R. F. Weir was read and accepted.

The same rules as last year were adopted in regard to publishing the papers, revision of proof, and adjournment.

The minutes of this session were read, approved, and at 8.15 P. M., the Society adjourned.

J. ORNE GREEN, *Secretary.*

REPORT ON THE PROGRESS OF OTOLOGY.

BY C. H BURNETT, M. D., AND C. J. BLAKE, M. D.

THE preparation of the Report on the Progress of Otology during the year that has passed has been shared by a committee of two, in accordance with a suggestion made by the committee of last year. The Report is divided into three parts: I. Anatomy and Physiology, by Dr. Burnett; II. Pathology and Therapeutics, by Dr. Blake; and III. Reviews and Book Notices, by each member of the committee.

There is a bibliographical record for the year appended to the Report, in which the articles forming the basis of the Report may be readily found by the alphabetical arrangement of the authors' names.

With the hope that it may prove acceptable to the Society, and all other readers, the following report is respectfully submitted by the committee: —

I.

ANATOMY AND PHYSIOLOGY.

Prof. Gruber has extended his investigations concerning anomalies in the connection between the malleus and the membrana tympani, describing three more varieties of abnormal connection.

The first consists in a round vesicle extending over the upper part of the manubrium of the malleus and the antero-superior segment of the membrana tympani. This vesicle is nothing more than the result of a collection of fluid induced by hyperæmia or inflammation in the membrana tympani.

The second anomaly is only a higher grade of the first; it is of rare occurrence.

By an extension of the vesicle downwards, parallel with

the handle of the malleus, the latter appears doubled. In such cases, Gruber thinks that the cartilage of the anterior portion of the manubrium of the malleus is loosened and pushed out of position.

The third form of anomaly is considered to be a combined result of the first two forms already mentioned.

In this form the short process appears dislocated upwards in a few cases, but more usually downwards and upon the posterior surface of the manubrium of the malleus. "Of course," says Gruber, "this is not a dislocation of the short process, but simply one of the upper end of the cartilage in connection with it." This dislocation, the author says, he has seen as a sequel of hypertrophic inflammatory processes in the mucous membrane of the middle ear. This condition is attended, furthermore, with alterations in the position of the membrana tympani and ossicles, viz. a retraction and simultaneous turning of the malleus about its long axis.

Prof. Gruber also calls attention to another change in appearance he has observed in cases of the abnormal position of the malleus just described. He says, "It appears as if the cartilaginous segment, extending from beneath the short process to the end of the manubrium of the malleus, were raised up and shrunken. The outermost edge of the manubrium in such cases assumes a wavy appearance."

Prof. Voltolini again calls our attention to his pneumatic aural speculum and its advantages. His first statement is that the usual aural mirror, which reflects ordinary sunlight into the meatus, is only of use to short-sighted aurists, whereas his speculum, in which the reflecting plane-mirror is only 3″ from the membrana tympani, can be used by direct sunlight, as well as with simple daylight, by every eye.

He furthermore claims that with his speculum we are better able to see both the normal appearances and the manifold variations of the pyramid of light, all of which only serve as proof that the *funnel shape* of the membrana tympani causes the pyramid of light and not the inclination of the membrane to the axis of the meatus.

Its pyramidal shape is due to the fact that the membrana tympani, which in this connection must be regarded as a concave mirror, becomes smaller towards the centre, and therefore the reflected image, *i. e.* the parts of the pyramid of light, become smaller towards the centre of the mirror, *i. e.* of the membrane. In this article, Voltolini likens the membrana tympani to the tapetum of the choroid, which is practically a concave mirror, and reflects a minimum of the light falling into the eye. We have consequently a pyramid of light in the eye as well as in the ear, and our author says we may speak of "shining ears" as well as of "shining eyes."

Among the practical advantages of this speculum, we find that the author claims that if by its use we are unable to alter the appearance of the pyramid of light, we may safely conclude that the membrana tympani is adherent throughout its entire extent.

In the same article, Voltolini says that the normal color of the membrana tympani is pearl gray (a merely confirmatory statement of the observations of others), and that the membrane in its normal condition is only translucent, not transparent, even in the brightest sunlight.

In those cases where the contents of the tympanum are visible through the membrana tympani, we may conclude that the latter is more or less atrophied.

This speculum will also enable us to tell whether the membrana tympani is perforated, and if it be, we can by its use empty the tympanum of its fluid contents by suction; but the last two ends may be gained equally well by Siglé's pneumatic speculum.

The operations for tenotomy of the tensor tympani and loosening the adherent membrana tympani from the inner wall of the tympanum, may be performed by the aid of this speculum. Dr. Trautmann has investigated most thoroughly the optical causes of the "triangular shining spot," or the pyramid of light, on the membrana tympani, in an article which he calls "The Shining Spots of the Membrana Tym-

pani" ("Lichtreflexe des Trommelfelles"). This paper is admirably illustrated by nineteen diagrams explanatory of the optics of concave and convex mirrors, as well as the "shining spots" upon the inner and outer parts of the surface of the funnel or concave mirror formed by the natural membrana tympani.

Under the third head of this paper, the author sums up the following reasons for the "spots of light" (Lichtreflexe) which usually occur in membrana tympani.

He says, "The normal membrana tympani has quite a high degree of superficial lustre, is inclined at an angle of 45° in its vertical plane, and in its horizontal plane it is inclined 10° towards the right on the right side, and 10° towards the left on the left side. Furthermore, it is drawn inwards so as to form a funnel, the point or apex of which lies in the centre of the anterior periphery of the yellow, sickle-shaped expansion at the end of the anterior edge of the manubrium of the malleus; the angle at which the walls of the funnel meet is greater than a right angle, the depth of the funnel is equal to about 2mm. and the distance from the apex to the periphery is $2\frac{1}{2}$–3mm. anteriorly, and 3mm. posteriorly.

Therefore a "spot of light" or a reflection of light from the plane surfaces of the membrana tympani cannot reach the eye of an observer, because the rays of light from without, on account of the inclination of the membrana tympani, fall upon the plane surfaces of the same, at a very acute angle. Since the angle of reflection is equal to the angle of incidence, the rays of light from the planes of the membrane which has an inclination of 45°, must strike the inferior wall of the external auditory meatus, and are in consequence unable to reach the eye of the observer.

The relations are, however, different, when we consider the "reflection of light" which is found in a funnel-shaped spot. On account of the vertical inclination of 45° of the membrana tympani and of its horizontal inclination of 10°, the antero-inferior quadrant of the membrana tympani is at right angles to the illuminating object. Since, now,

the illuminating body and the eye are in the same line,* the rays of light which fall perpendicularly upon the antero-inferior quadrant must reach the eye, and therefore the eye sees a "reflection of light" only in the antero-inferior quadrant, the reasons of which are more fully explained by the author under the second part of his paper. Since the walls of the funnel meet at an angle greater than a right angle, this triangular reflection is a direct one, as is fully explained under the aforesaid second part, which treats of the physical reasons for all prominent reflections of light (sich abhebende Lichtreflexe) occurring on shining or polished surfaces.

A number of anatomical modifications of the temporal bone have been pointed out by Zuckerkandl.

These modifications are shown to be the result of an extraordinary development of vessels which are usually small and insignificant, but which, by the aforesaid development, alter the structure of the temporal bone,— a fact of such importance that an investigation of two hundred and eighty skulls was made in order to arrive at some conclusion respecting the causes of these important modifications of the temporal bone.

The first modification is termed the sinus petrosquamosus, and is produced by a semi-canal in the line of the fissura petroso-squamosa, and connects, by means of a largely-developed vein, one of the middle meningeal veins with the sigmoid sinus.

The sinus petrososquamosus may be ambilateral or unilateral. That portion of it usually found on the anterior aspect of the temporal bone may be wanting as far as the canal of the posterior part of the petrous bone.

A converse modification is seen where the canal usually passing over the posterior part of the petrous bone to join the sinus petrosquamosus is wanting.

---

* The external auditory meatus is so narrow, that the observer and the source of illumination had better be in the same line, in order to obtain the best possible illumination of the membrana tympani.

This sinus may be very short, emptying into the sinus petrosus superior, instead of passing backwards as far as the sigmoid sinus.

In the second part of his paper, Zuckerkandl has pointed out some features of the sulcus petrosus superior, which give it the character of a diploëtic vein of the petrous bone. In the same division of this article he alludes to the modifications of the sigmoid sinus, and that portion of it denominated the bulbus of the sigmoid sinus.

This latter anomaly, says our author, in some few cases may assume a dangerous character by causing a thinning of the mastoid portion of the temporal bone lying over the aforesaid bulbus of the sigmoid sinus.

In one instance he found the soft parts of the scalp at one point separated from the bulbus of the sigmoid sinus by a layer of bone as thin as paper; and at another point the soft parts of the scalp were in direct contact with the bulbus of the sigmoid sinus.

In the third portion of the paper on "Anomalies of Development in the Petrous Bone," we find the following remarks on the anastomosis of the arteries of the labyrinth: "After the vestibular artery reaches its destination, it divides at the posterior wall of the vestibule into several branches which arch towards the outer wall of the vestibule. We possess no information respecting the connection between these vessels and the of those cochlea, although the anastomosis of these vessels can be seen by the removal of the anterior wall of the vestibule in any well-injected preparation of the temporal bone.

"The cochlear artery, which alone gives off 15 or 20 arterioles to the membranous portions of the cochlea, gives origin to a large branch, passing through the lamina spiralis ossea, *via* the modiolus, into the vestibule.

"This branch gives off three other branches: —

"1. One to that portion of the lamina spiralis membranacea et ossea lying behind the promontory.

"2. One to the superior wall of the vestibule, and

"3. A branch which anastomoses with the branches of the artery of the vestibule.

"Hence, we see that the arteria auditiva, whose connection with the ostium of the tympanum has never yet been demonstrated, forms a completely closed net in itself.

"The diploëtic substance which surrounds the labyrinth shows a similar richness in larger arteries."

Zuckerkandl has also described a constant and peculiar anatomical connection between the Eustachian tube and the constrictors of the pharynx, under the name of the ligamenta salpingo-pharyngea. He states that "upon opening the posterior wall of the pharynx and dissecting off the mucous membrane, along the periphery of the pharyngeal opening of the Eustachian tube and adjacent parts, we shall find three, four, or five or even more tendinous, rarely elastic cords attached to the pharyngeal end of the hooked cartilage of the Eustachian tube, and the outer wall of the same, which, in their fullest development, the author likens to the tendinous cords connected with the valves of the ventricles of the heart.

"This anatomical arrangement produces a free opening of the Eustachian tube at each contraction of the superior and middle constrictor of the pharynx."

We are also informed that "if the cavity of the tympanum is laid open, in a perfectly fresh specimen, the ligamenta salpingo-pharyngea of which have been dissected, we shall find upon stretching these cords downwards that the ossicles of hearing will be visibly moved, and that alterations of attitude in a drop of water placed in the cavity of the tympanum will also be produced." A similar natural tension is produced in these "tendinous cords" by the action of the arcus palato-glassus brought about by opening the mouth very widely.

At a meeting of the Boston Society for the Advancement of Medical Science, Dr. Blake described a peculiarity observed by Prof. Wyman first in the crania of Hawaiian Islanders, and subsequently in the crania of ancient Peru-

vians, consisting of exostoses of the external auditory meatus occurring uniformly on the superior and inferior lips of the lamina forming the posterior wall of the passage, the same peculiar growth being described by Welker as occurring in the crania of American Indians. Out of three hundred and thirty-four Peruvian crania examined by Prof. Wyman, these growths were found in six, and in various degrees, from a small pedunculated growth on the superior lip of the lamina to double growths on both lips nearly occluding the orifice of the passage. It was noticeable, moreover, that these growths were nearly uniform in size and shape on both sides. Out of eight Peruvian crania, belonging to the collection of Mr. Blake, in the Warren Museum, but one presented this peculiarity, and then only in the form of an elongated ridge upon the posterior wall of the meatus on one side. The supposition that aquatic habits might have to do with the presence of these growths, though applicable in the case of the Hawaiian Islanders, would not apply to the Peruvians, living as they did in a tract of country remote from the sea and remarkable for its aridity. That the occurrence of these growths is coincident with the development of the wall of the osseous meatus, as suggested by Dr. J. O. Green, is further supported by the fact that the location of the growths was a constant one.

Dr. Hasse has continued his researches into the "general plan upon which the peri- and endo-lymph of the inner ear is renewed." The results of his investigations upon this subject, in connection with all classes of vertebrates, I shall give to you in the author's own words, which may be found on page 768 of his "Anatomical Studies," No. xix: —

"All vertebrates possess a duct which originates in the vestibule; and in all animals, with the exception of the Plagiostomes, in which it passes directly to the surface of the skull, this duct enters the cavity of the cranium and there terminates either in a closed sac at the confines of an epicerebral lymph-cavity, or opens into the same. This is the ductus endolymphaticus or the aquæductus vestibuli with the

saccus endolymphaticus, the former of which, in most vertebrates, arises from the sacculus, that is, from the inferior portion of the vestibule. In fishes, the perilymphatic fluid is poured into the cavity of the skull without any special conduit, and empties into the epicerebral chamber; in Plagiostomes, it is excreted directly upon the skull; and in other vertebrates, a special way of excretion of the peri-lymph exists by means of a narrow canal, which empties either into the epicerebral lymph-chamber, or passes into a lymph-sac which lies in the foramen jugulare, which sac terminates on one side in a peripheral lymphatic duct, and on the other side passes into the epicerebral lymphatic space. This canal is the canalis s. ductus perilymphaticus with the saccus perilymphaticus, which leaves the auditory capsule (Gehörkapsel) either through the foramen rotundum or through the so-called apertura aquæductus cochleæ, and conveys the perilymph from the auditory capsule to the periphery."

After tracing the aquæductus vestibuli through all classes of vertebrates, and having established the existence of one simple fundamental form for all, the author then endeavors to explain the physiological function of this organ. He lays down three probable functions of this structure. 1. The endolymphatic duct and its sac are the source of the endolymphatic fluid in embryonal life. In this capacity the sac plays the more important part, through its epithelium and the vessels which are distributed to it, forming a kind of gland.

2. The aquæductus vestibuli, in adult life, may act as a conveyer of new material to the endolymph, either by means of endosmosis from the epicerebral cavities in those instances where the sac is closed, or by means of a direct current where the saccus is open.

3. We might reasonably suppose that the sac was useful as a reservoir for the liquor endolymphaticus in any case where the intra-labyrinthal pressure attains an excessive height. By the reception of the fluid into the sac in such a case the pressure would be reduced in the labyrinth.

The author also gives the following reasons for what he

considers an uncommon practical importance in the ductus endolymphaticus: —

"Every increased or diminished pressure of the fluid of the liquor cerebrospinalis in the subarachnoidal cavity will make itself felt per continuitatem through the saccus and the ductus endolymphaticus, in the interior of the auditory apparatus, in the endolymphatic cavity and upon the terminal apparatus of the auditory nerve found therein. We may thus explain most easily the impairment of hearing for high tones in cases of increased pressure."

Furthermore, pathological processes in the subarachnoidal space are conveyed either by continuity or contiguity through the saccus and ductus endolymphaticus into the interior of the labyrinth, and vice versa, the latter instance, of course, being the rarer from the deep-seated position of the inner ear. Thus every alteration in the chemical constitution of the cerebro-spinal fluid necessarily produces a change in the liquor endolymphaticus, which alteration must exercise some influence in the occurrence of subjective acoustic perceptions as a result of disturbed nutrition; in any event it must have an effect upon the composition of the liquor endolymphaticus.

That portion of the treatise which traces out the comparative relations of the aquæductus cochleæ in the vertebrates closes with the following remarks by the author on the physiological importance of the perilymphatic cavity: —

"The cavum perilymphaticum is inserted into the lymphatic tract of all the vertebrates and is connected with the subarachnoidal cavity by means of the foramina acustica, and thence indirectly with the peripheric lymphatics, which in connection with the large nerve-trunks pass from the perilymphatic cavity by means of the ductus and saccus perilymphaticus. We can therefore perceive that all changes experienced by the liquor cerebro-spinalis, whether they be of a chemical or physical nature, must act upon the liquor perilymphaticus and thence upon the organ of hearing, causing subjective perceptions of sound.

"On the other hand, pathological processes which could transmit themselves, through the ductus endolymphaticus, from the cavum subarachnoideale into the interior of the membranous labyrinth, by virtue of their continuity or contiguity, could also exercise an influence in the cavum perilymphaticum, thus furnishing a not unsound anatomical basis for the elucidation of morbid conditions of the inner ear.

"This relationship between the liquor perilymphaticus and l. endolymphaticus supplies the possibility of an afflux and efflux of the fluid element, a renewal of the same, and the removal of the products of retrograde metamorphosis, and we are therefore justified in supposing that there is a constant circulation of lymph in the inner chambers of the membranous labyrinth as well as in the space between the membranous labyrinth and the auditory capsule (Gehörkapsel). The rapidity of this current is equal to that of the lymphatic stream in the lymphatic cavities with which it is connected, chiefly to that of the cavum subarachnoideale, perhaps less rapid. The consequences of this relationship will be shown in a forthcoming treatise."

This work of Prof. Hasse on the lymphatic system of the inner ear is based upon a series of observations on all classes of vertebrates, and from time to time he has published, in separate form, investigations on the auditory apparatus of a species which are now woven into the complete chain of reasoning which he has laid before the world of science.

Dr. Hasse alludes to the important aid he has derived from his predecessors in this field of study; especially prominent are the names of Cotugno, Meckel, Breschet, Windischmann, and Rathke.

The contemporaneous writers alluded to by Dr. Hasse are Clason, Ketel, Schwalbe, and Böttcher, from whose labors Dr. Hasse has gleaned, as he states, much that is of great value in carrying on his investigations, which have formed the basis of the theory contained in his new work. However, our author says, he does not claim to have established a positive and complete theory, — "On the contrary, it is only

a further developed investigation which is still under consideration, and does not claim to be a complete theory." "If it will stimulate others to produce something more complete, then my principal object will be attained," says this distinguished writer on the comparative anatomy of the auditory apparatus.

Dr. Curschmann has performed a series of experiments upon the relation existing between the semicircular canals and the equilibrium of the body. He has kept in view the following cautionary rules: —

1. The least possible destruction of tissue in the exposure of the semicircular canal.

2. Careful avoidance of excessive hemorrhage, especially from the venous sinus which accompanies the semicircular canals.

3. The least possible injury to the bony canals, since, from their intimate relation to the cavity of the cranium, they cannot be destroyed without a previous opening of the cranial cavity, with an immediate or secondary injury of the cerebellum.

With these precautions, after the bony canals were laid bare, small openings were made in the canals, and either the entire membranous canals, or pieces of them, were removed by means of the forceps.

The author draws the following conclusions from his experiments: —

(1.) Injuries of the semicircular canals produce special disturbances in the equilibrium of the body. It is entirely incorrect to attribute the latter to the attendant injury of other parts.

(2.) The manifestations produced by the lesions are, in general, proportional to the extent of the same.

(3.) In all cases of disturbance in the equilibrium of the body of the animals experimented upon, we are not to consider the motor paralysis or spasmodic conditions, but we must always consider the *disturbances in the accommodation of muscular action.* This is usually denominated vertigo in the animals experimented upon.

(4.) According to the injuries inflicted upon the separate semicircular canals of the pigeon, we observe characteristic differences in resultant manifestations. It makes, also, a great difference, whether the structures upon only one or upon both sides are destroyed.

(5.) Regardless of the extent of the lesion, all the manifestations are more intense and more distinct, the more energetically the animal moves; so that in cases of the slightest injuries (simple section of the canal on one side of the body) the characteristic symptoms are seen only when the animal makes a vehement motion, whereas these motions are scarcely perceptible or may be overlooked when the animal is at rest or is performing ordinary acts of locomotion.

(6.) These manifestations of altered co-ordination in muscular motion are observed in the head, in the trunk, and in the extremities.

(7.) The supposition that the disturbances in the motions of the trunk are due to the defective equilibrium or defective position of the head is to be rejected for the following reasons: —

(*a*.) Because disturbances in the equilibrium of the body occur in cases of injury to the semicircular canals on one side, in which, as has been already stated, the pose and movement of the head are not materially altered.

(*b*.) Because that supposition would explain only general manifestations of vertigo, but it would not explain the characteristic partial disturbances in equilibrium which arise in connection with injury to separate semicircular canals; and —

(*c*.) Because certain experiments not described here, militate directly against such a theory.

Even after complete ablation of all three of the membranous semicircular canals, upon both sides, pigeons do not appear to be deprived of all power of directing their bodies.

Strong animals of this class regain, to a certain extent, while at rest or when moving very slowly, the power of posing their bodies.

(9.) After a simple section of a single canal, the resultant

symptoms vanish in from four to five days, unless the structure becomes secondarily diseased, which is hardly ever the case, if the experiment has been made with care. In these cases, however, a restitutio ad integrum does not always occur in the anatomical relations of the parts implicated. If only small pieces of the semicircular canals are removed, a marked recovery may ensue, more readily, however, for certain reasons, when the lesion occurs in a vertical canal than when it occurs in the horizontal canal.

(10.) The almost constant increment and frequent alterations in the original symptoms, which follow a large injury of the canals, are due to subsequent disease of the remnants of the wounded canals or to secondary alterations in the parts of the canals left intact.

(11.) The author is unable to give a comprehensive theory of the mechanism by which the semicircular canals exert this influence, which he has portrayed as occurring in cases of injury or disease.

The various hypotheses which have heretofore been offered in explanation of these symptoms are not tenable, in his opinion.

It is especially incorrect, in his estimation, to regard the semicircular canals as a kind of "organ of sense" for the equilibrium of the body.

(12.) The symptoms are the result of a *cessation of function*, not a result of an irritation, certainly not of a specific irritation of the acoustic nerve.

(13.) We are not to conclude, that, since the hearing is not materially altered by a removal of the semicircular canals, they are not correlated to it.

The anatomical and the physiological facts would show that they are connected with the function of hearing.

Prof. Lucæ, to whose able resumé of Curschmann's experiments I am indebted for the facts I have presented here, states that the various disturbances in equilibrium, produced in accordance with a section of the horizontal or vertical semicircular canal, were accurately demonstrated by the

author before the Medico-Psychological Society of Berlin, when Prof. Lucæ was present.

The results of Prof. Cyon's investigations concerning the function of the semicircular canals are thus given in the M. F. O., December, 1873: —

(1.) In order to preserve the equilibrium, it is necessary that an animal have the correct conception of the position of his head.

(2.) The function of the semicircular canals is to inform the animal, by means of a series of unconscious (acoustic?) perceptions, of the correct position of its head in space, and for this purpose each semicircular canal has an exactly determined relation to a dimension of space.

(3.) The disturbances in motion, which occur after section of the semicircular canals, are of three kinds.

(*a.*) Disturbances in equilibrium as direct results of the artificial injury.

(*b.*) Involuntary movements, as results of the irritation of abnormal acoustic perceptions produced by this injury, and

(*c.*) Consecutive manifestations produced by the inflammation of the cerebellum, which sets in a few days after the operation.

Cyon has shown that a pigeon, in which both horizontal semicircular canals have been severed, will perform regular oscillations of its head in a horizontal plane. On the other hand, a pigeon in which the vertical semicircular has been severed will perform similar oscillations of its head in a vertical plane.

Dr. J. Breuer has published a very interesting and important work, concerning the functions of the semicircular canals of the labyrinth. Prof. Mach has published the results of his investigations into the same subject, and has come to nearly the conclusions as Breuer. The results obtained by both of these investigators are confirmatory of the well-known theories of Flourens and of Goltz. (Archiv für Physiol. 1870.) The theory may be again stated in these

words: "The semicircular canals are organs of the sense of equilibrium of the head and mediately of that of the entire body."

The experiments to illustrate the physical phenomena of the semicircular apparatus are given in the author's (Breuer's) own words: —

"A system of three tubular rings, at right angles to each other, are filled with fluid. We thus gain a fair representation of the semicircular canals. In such a system we shall find that with every rotary motion of the entire system (*i. e.* the head) currents of the contained fluid will occur in a direction opposite to that of the rotary motion of the head. The measure of this current in each canal depends upon the plane in which the head is turned, and upon the amount of rotation. Between the rotation of the head and the movements of the enclosed fluids, fixed relations exist. If the movements of the fluid are perceived, they will of course furnish exact information concerning every turning of the head." The acoustic hairs (Hörhaare) are brought forward as the possible perceptive apparatus of this movement, for they are situated at a broad, smooth spot in the canal and project at right angles into its calibre. Thus from their position they would be especially sensitive to the variations of the currents in the endolymph, and we know that they are connected with nerves, the terminations of which they represent.

The analogous terminal nervous apparatus in "the lateral organ" of the fish appears to act the part of an analogous organ of perception for the currents, resistances, etc., in the surrounding water. (F. E. Schulze.)

"If we wish to harmonize both of these facts with Goltz's theory we must *assume* that every current of the endolymph is perceived by the nerves of the ampullæ, and that it produces an idea of the rotation of the head in the plane of the semicircular canal most implicated, and in a direction opposite to the current; but that the perceptions of the six ampullæ of both labyrinths unite in forming a joint conception." (Breuer.)

Prof. E. Mach has contributed additional corroboration of the theories of Goltz and Breuer by a series of novel experiments upon man, which were published a short time before the results of Breuer's labors. I think I cannot do better than to give the description of these experiments in the words of Prof. Fick (Archiv. f. O. N. F. Band II, H. 4) : —

"Mach suspended a chair in which a man could sit with ease, in a frame-work, so that the chair could be revolved about a horizontal axis and fixed at any inclination. In addition, the entire frame-work with the chair could be revolved about a vertical axis. In many of the experiments the chair was covered by a paper box, which, following all the motions of the chair, prevented the person sitting in it from observing with his eye the motions of the apparatus in which he was seated.

"The principal results of the experiments with this apparatus were the following : —

"A revolution about the peculiar vertical axis of the body is perceived by the person experimented upon only so long as it is accelerated.

"A continued and constant revolution is not perceived.

"Retardation of the revolution is perceived as a revolution in the opposite direction."

"It is apparent that these facts agree with the theories of Breuer. The sensation of revolution in the opposite direction is converted into the sensation of motion in the true direction, in two seconds, by a renewed acceleration of the original motion. This sensation, therefore, must continue a few seconds longer than the cessation of the retardation; for otherwise, the new acceleration should produce immediately a sensation of revolution in the original direction. If we accept Breuer's hypothesis, we must suppose that by the law of inertia the currents produced in the semicircular canals continue some seconds after the force producing them has ceased.

If during the revolution about the vertical axis the head is inclined forward and then suddenly elevated at the mo-

ment the revolution ceases, in those cases where the revolution has occurred from the left, forwards and towards the right, an impression will be gained that a revolution is occurring from the right, upwards and towards the left, and the person thus experimented upon will fear that he is about to fall towards the left. This fact is also in harmony with the hypothesis of Breuer, and proves most strikingly that the position of the head is a measure of the sensations of revolution, and that the organ of these sensations must be found in the head. These two fundamental facts have already been observed by Purkinje, but with less exactitude than by Mach. Furthermore, Mach has established, by the aid of his apparatus, the fact that we have, either with the body at rest or revolved with a constant velocity, a distinct consciousness of the direction of the resultant accelerating force without the assistance of the eyes. A man sitting in the chair was able to give, by means of an indicator projecting from the case, a tolerably correct statement as to the vertical direction in any of the variously inclined positions of the chair.

When the case containing the chair was revolved about a vertical axis situate at some distance from the chair, like the well-known "caroussel toy," and when the face of the one experimented with was turned towards this axis, the axis then given by him as the vertical one was in reality one inclined diagonally downwards from the axis corresponding to the resultant of the centrifugal force produced by the revolution with constant velocity, and the weight of the body revolved.

Certain facts of a similar nature, perceived prior to this, induced Breuer to add to his hypothesis already described, the supposition that we should consider the macula acustica with the otoliths as possibly an organ for the perception of the position of the head at rest, in respect to the direction of the resultant accelerating forces and the rectilinear motions. In this portion of the acoustic apparatus he perceives the fulfilment of the necessary conditions. He thinks we are justified in assuming that the otoliths are specifically heavier

than the endolymph, and that they consequently have a tendency to sink in it in the direction of the resultant accelerating force. According to the direction of this force in the head, the otoliths would drag, in various ways, upon the hairs with which they are connected, and thus produce a varied excitation of the terminal nervous apparatus.

In addition to this, the specifically heavier otoliths would have, at the beginning of a rectilinear motion, a tendency to remain behind the endolymph, and at the cessation of the same they would go in advance of it, and therefore they would, by mechanical action upon the cilia, produce a perceptive sensation.

Dr. A. H. Buck has written a brochure on the mechanism of hearing, in which he advances a new theory. He says: "My own investigations, so far as they go, favor the view that no communication exists between the two scalæ in the immediate vicinity of the cupola, unless the opening (helicotrema) spoken of so vaguely by the authors, be microscopic in size." Dr. Buck shows that a force applied to the fluid contents of the scala vestibuli, will be communicated to Reissner's membrane, and thence to the membrana basilaris. The displacement of the contents of the scala tympani, caused by the depression of the entire membrana basilaris, is provided for by the presence of an elastic membrane, the membrana tympani secundaria.

The author then goes on to say, that "the entire membrana basilaris, including high and low notes alike, is obliged to perform all the excursions which may be communicated to the stirrup or the membrana tympani by sonorous vibrations; or, to speak more minutely, with every tone sounded, every 'organ of Corti' must perform the excursions which belong to that particular tone.

"Although it must be true that, with every note sounded, all the organs of Corti must perform the excursions belonging to that note, yet it must be remembered that the semi-gelatinous membrana tectoria, which rests upon the cilia of the hearing-cells, will likewise be obliged to perform these same excursions."

"Over one particular region, however, of the membrana basilaris, this will not be the case, namely, in that portion where the thirty or more basilaris fibres are tuned to vibrate in sympathy with the note sounded. At this point the vibrations will be of sufficient vigor to throw off the membrana tectoria. So long, then, as that particular note is sounded, the cilia of the hearing-cells, in the region referred to, will receive a succession of taps from the membrana tectoria, or, to speak more strictly, will strike against this membrane."

These blows, Dr. Buck says, constitute the true irritation of the auditory nerve. "Wherever the blows do not take place, although the auditory nerve-filaments may be agitated in a direction at right angles to their length, then no sensations of sound will be communicated to the brain."

Dr. Buck also suggests an explanation of the function of the semicircular canals. He rejects the theory of Flourens and Goltz, and says: "The first thing that attracts our attention in the anatomy of these organs is the peculiar relation of the membranous to the bony canals, the former occupying scarcely a third of the calibre of the latter. Then, in the next place, the space between the membranous canal and the bony walls is filled, not with free fluid, as is the case, for example, in the cochlea, but with a reticulated connective tissue, rich in blood-vessels and made up of large meshes containing fluid. In the vicinity of the mouths of these canals, however, it should be noticed that the membranous tubes hug the bone more closely. If we examine the mode of construction of the membranous canals, we find that the outer elastic wall is lined with a sort of mucous membrane whose free surface undulates or is thrown into mounds, and carries a lining of ordinary pavement epithelium. Another point worthy of notice is the absence of the undulations or mounds on that "side of the canal which lies next to the bone, the side where dilatation cannot take place. These anatomical relations and the absence of nerves are certainly suggestive of the thought that the function of these canals must be a mechanical one. Is not their function, we would ask,

to protect the ductus cochlearis and the organs of Corti from injury in cases where the stirrup is driven too violently into the oval window? Any pressure made upon the utriculus can only find a yielding point in the elastic walls of the membranous semicircular canals; and furthermore, if the latter were lined with a smooth instead of an undulating epithelial surface, the distension would be followed by a rupture of the epithelial lining. Any sudden and loud noise, like the report of a cannon or a peal of thunder, would be likely to injure the cochlear structures, were not some provision made in the labyrinth for emergencies of this kind. As we have shown, the semicircular canals are not only admirably fitted to serve in the capacity of safety-valves, but their entire mode of construction, especially the absence of all nervous structures, would seem to exclude them from any higher office in the mechanism of hearing."

We presume that by the term *semicircular canal* Dr. Buck alludes to that portion of the canals above the usually included ampullæ; otherwise, his statement, that there is "an absence of all nervous structures" in these canals, would not be strictly correct. Granted, that the function of the major portion of each semicircular canal is to act as a safety-valve in cases of undue pressure upon the labyrinthine fluid, it seems that such function must be just as advantageous to the proximal nervous structures in the ampullæ as to those in the more remote cochlea. Possibly more so, if the nerves of the ampullae are intended to receive the impressions produced in the air by the long, powerful waves of ordinary noises.

Furthermore, if the theories of Flourens and Goeltz, and latterly of Breuer and Mach, that the function of the semicircular canals, *i.e.* of their nervous contents, is to preside over the sense of equilibrium, be correct, a safety-valve may be all the more necessary in connection with the important nerves at their mouth.

Dr. Victor Urbantschitsch has pointed out the physiological nature of certain membranous and cord-like adhesions in

the cavity of the tympanum, which have heretofore been considered pathological. As the author states, Prof. Politzer was the first to express the opinion that such might be the case, and our author has verified this opinion by a series of careful and copious investigations on the cadaver of embryos, new-born children, and adults.

This writer has frequently found in the new-born child, membranous and cord-like connections between the inner side of the vertical shaft of the incus and the inner wall of the tympanum. This has been considered pathological by Toynbee and other authors; but Urbantschitsch has shown that these formations are remnants of an embryonic fold, running from the vertical ramus of the incus to the inner wall of the tympanum, enclosing entirely the stapes. This was seen eight times in embryos, fifty times in the new-born child, and sixteen times in fifty examinations of the tympanic cavity in the adult.

There is also an embryonal stapedial fold which sometimes leaves as residue small membranes or cords passing from the head and shafts of the stapes. But the writer does not assert that all of the connecting bands or membranes which he has described are always of a physiological nature; he believes that their occurrence, without any morbid changes in the tympanic cavity, would not justify the conclusion that pathological process preceded their formation. Similar connections between the posterior, anterior, and exterior surface of the vertical ramus of the incus with the structures of the tympanum are shown to be normal. The first point agrees with the investigations of Lincke; the second point agrees with the statement of v. Troeltsch.

The horizontal ramus of the incus may be joined to the external wall of the tympanum, and with the mastoid cells, by similar membranous connection. The union with the outer wall has already been shown by Zaufal to be a normal one. This was found by Urbantschitsch in 80 per cent of all the adults examined.

The membrane so frequently found between the tendon of

the tensor tympani and the antero-superior wall of the tympanum, as described by Prussak, Gruber, and Zaufal, has been observed in adults by Urbantschitsch, sometimes as a perfect membrane, and sometimes perforated in the middle or represented only by a few adhesive bands.

Hyrtl's discovery that osteophytes are regularly found in the tympanum of many of the mammals, is carried still further by our author, who shows that there is in the tympanum of man a series of membranous bands containing structures similar to osteophytes which are of a physiological nature. They were found in one third of all the adult tympana examined.

Hyrtl says that these osteophytes are formed in the tympana of animals during the early years of life; our author has found them in the tympanum of the new-born child sixteen times in fifty examinations.

These are usually found on the eminentia pyramidalis. They may also be found on the posterior-exterior wall of the tympanum, and on the border of the round window.

They are usually in connection with a membranous or cord-like structure. Meckel has described a bony bridge between the eminentia pyramidalis and the oval window. In one case, among fifty examined, Urbantschitsch found a bony growth from the eminentia pyramidalis to the inner wall of the tympanum.

The posterior wall of the tympanum often contains a bony formation resembling a lamella. "This forms, either alone or in combination with membranes, a partition which divides the posterior portion of the tympanic cavity into a superior, larger space, and an inferior, smaller one."

Dr. Küpper has related a curious case of clonic spasm of the muscles of deglutition accompanied by a peculiar objective noise in both ears. The friends of the patient could easily hear this noise, which occurred as frequently as one hundred and forty times in a minute, and closely resembled the snapping of the finger-nails. The noise would sometimes cease on one side, continuing on the other, and the noise in

at least one ear continued during sleep. The spasms of the muscles of deglutition continued without any remission. The hearing was not affected, the Eustachian tubes were pervious to the air-douche, but the mucous membrane of the nose and pharynx was greatly congested.

The membrana tympani is said to have shown no alteration in its curvature or position during the occurrence of the peculiar noises.

Mach and Kessel have performed experiments upon the "accommodation of the ear," the chief point in their investigations being a determination of the question "whether a traction upon the muscles of the tympanum will produce an alteration in the consonance of the auditory apparatus, for notes of various pitches."

The experiments performed were of two kinds: first, upon the cadaver, and second, upon the normal ear of living men.

The authors say: "Our results are in unison with those of former investigators. All observers agree that contraction of the tensor tympani, whether produced artificially or by natural causes, will render high notes more audible than the low ones." The experiments of Politzer show this. The experiments of Schrapinger are also in harmony with those of Mach and Kessel; for when S. shows that the voluntary contraction of the tensor tympani will render all tones less intense, he likewise admits that the prominence of the over-tones is only relative, since they are less affected by this contraction of the tensor than the lower ones.

Kessel's investigations concerning the influence of the muscles in the tympanum upon the movements and vibrations of the membrana tympani, in the cadaver, are divided into the following heads: —

I. The action of the muscles of the tympanum produced by traction upon them.

II. The stroboscopic movements of vibrating membranæ tympani during a note of constant pitch.

III. The stroboscopic motions of the membrana tympani, vibrating with a fundamental note and its octave.

In the first part of this paper the author divides the membrana tympani into various sectors and segments, as follows:

1. Into two grand divisions, the upper and the lower, the dividing line being the one made by the two folds of the membrane. The upper division, *i. e.* above the line of the "folds," is subdivided into three sectors, while the lower division is subdivided into two segments. The three sectors of the upper division lie as follows: one between the anterior fold and the anterior suspensory ligament of the malleus, naturally termed the anterior sector, the middle sector, lying between the suspensory ligaments of the malleus, and the posterior sector, lying between the posterior suspensory ligament and the posterior fold of the membrana tympani.

In the inferior division of the membrana tympani the posterior segment lies behind the malleus, while the anterior segment lies in front of the malleus.

We are also informed that the radial fibres pass in two directions from the anterior suspensory ligament, increasing in their length. These pass upwards over the sectors and downwards from the anterior to the posterior segment of the membrana tympani. Hence we have in this case, two angular membranes connected with each other, and subdivided into unequal divisions.

In the inferior division the radial fibres are drawn into a convexity towards the meatus by means of the circular fibres, and they are maintained by the same means, according to Helmholtz, in a condition of tension and prominence.

At the umbo the circular fibres are not found, and Kessel calls this point the free, central portion of the radial fibres. The circular fibres are also wanting in the upper division (which is flat, excepting at the middle sector, which is somewhat concave) at the foramen of Rivini.

By means of Siglè's pneumatic speculum Kessel has determined the various degrees of tension in the different parts of the membrana tympani. He has found that the movements of the anterior and posterior segments of the membrana tympani are directly proportional to the length of the radial

fibres. In a positive pressure of air upon the membrane the manubrium of the malleus is enabled to revolve.

In a case of similar atmospheric pressure, the middle sector is seen to be more depressed than the other two.

In a case of negative pressure the converse of this is true. During rarefaction of the air in the auditory meatus the manubrium of the malleus moves not only outward and forward, but it moves so that the processus brevis is advanced upward and forward, and at the same time it makes a distinct rotation accompanied by a marked tension of the posterior suspensory ligament.

E. Mach and J. Kessel have performed a series of experiments upon the function of the cavum tympani and the Eustachian tube. Although their experiments were published in 1872, it is eminently proper to notice them here, for they are among important investigations which have not heretofore been brought directly before the Society.

The first proposition stated by these investigators is the following. I quote from the Archiv. f. Ohrenh. N. F. B. II, pp. 116, 121: "The waves of sound will produce the best effects upon the membrana tympani when it is unexposed on one side to the sound waves, *i. e.* when the Eustachian tube is closed."

On the other hand we must remember that a difference in the atmospheric pressure on both sides of the membrana tympani is a serious interference in the mobility of the membrane. Therefore, the Eustachian tube must be opened now and then in order to restore the equilibrium in the pressure of the air on each side of the membrane, which may have been interfered with by various physical causes.

The capacity of the tympanum must not sink below a certain limit, if variations in pressure of a certain amount are to produce vibrations of the membrana tympani of a certain amount; for if the capacity of the tympanum is small, then very slight excursions of the membrana tympani will produce considerable expansive power of the enclosed air, which will operate against further increase in the vibrations.

This is a very important circumstance in the consideration of the excursions produced by deep tones. In order that the latter may be received, the tympanum must have a certain depth and a generous capacity. Therefore the tympanum is in connection with the cavities of the mastoid process, and those of other portions of bone. A larger tympanum with perfectly regular outline and form would be impracticable from its great resonance. Therefore, the irregular, spongy, bony cavities, with which the ear is connected, appear of the greatest advantage.

Therefore, three conditions are favorable to the production of the largest possible excursions of the membrana tympani, by the waves of sound.

a. The Eustachian tube must be usually closed.

b. It must also be opened occasionally for purposes of ventilation.

c. The tympanum should be in connection with large, irregular cavities.

The first experiment was instituted to discover whether the Eustachian tube is closed. This was accomplished by the observer's placing himself in an air-tight box, in which the atmospheric pressure could be increased or diminished at will.

The alterations of the pressure within the box produced a distinct inward and outward movement of the membrana tympani, which is claimed as a proof that the Eustachian tube is usually closed.

The greatest differences in pressure which could be produced in the aforesaid box seemed to prove that, in the case of one of the observers, the tube was pervious; for the membranæ tympani always gradually returned to their normal position, notwithstanding the continuation of any alteration in the pressure, and without any voluntary act on the part of the observer.

During these experiments other very interesting observations were made concerning the effect of augmented tension of the membrana tympani.

It was observed that during the increased tension of the membrana, deep notes, produced by organ-pipes, outside of the air-chamber, or by the interruption tuning-fork, placed upon the air-chamber, disappeared or grew fainter in comparison to the higher notes.

In one instance the fundamental note was weakened, and the over-tones became very prominent.

Of course, the act of swallowing, during these experiments, would open the Eustachian tube and equalize the pressure on either side of the membrana tympani.

The third portion of the paper treats of the benefits of the closed Eustachian tube upon the amplification of the vibrations of the membrana tympani. Experiments showed that, if sound is conducted to the tympanum by means of the auditory meatus and the Eustachian tube at the same moment, the ossicles remain quiet; but if the sound-waves are suddenly cut off from the Eustachian tube, vibrations in the ossicles are instantly produced by the sounds conducted to them through the external auditory meatus. The unilateral conduction of sound appears to be, in general, necessary where vibrations of sound in an unlimited medium are expected to produce a stronger or amplified effect. Such, apparently, is the function of the natatory bladder of the fish, which, probably, represents the tympanic cavities. The communication of the air of the tympanum with that of the mastoid cells was demonstrated by means of an experiment devised by Kessel. The external surface of the mastoid process is bored through, and a T-shaped tube is placed in the hole thus formed. One of the arms of the T-shaped tube is drawn out into a point. Through the other arm ordinary burning gas is conducted, and lighted at the aforesaid pointed arm.

If, now, the membrana tympani be perforated, and the Eustachian tube closed, a gentle note from the organ-pipe, conducted into the meatus externus, will extinguish the flame. This latter fact shows that not only the vibrations are conducted to the mastoid cells, but that the latter are in

perfect communication with each other and the tympanum. If the membrana tympani lay too near the closed end of a tube, the other end of which is open, the relation would be similar to that of a membrane at the closed end of an organ-pipe, which shows no perceptible excursions. The latter will not appear until the membrane assumes a position at the open end of the pipe. It is manifest, therefore, that the considerable space behind the membrana tympani, viz. the cavum tympani, and the cavities connected with it, are of the greatest importance.

Rüdinger's endeavor to show that the Eustachian tube is always open by means of a capillary cleft in the superior part of the tube (the so-called "Sicherheitsröhre," or safety tube) is regarded with a certain amount of doubt by Mach and Kessel. It is regarded by them as a capillary tube filled with the secretion from the tympanum, and not as a conveyer of air. Since the air in the faucial extremity of the tube is alternately rarefied and condensed by the acts of respiration, the column of fluid contained in the aforesaid capillary tube (Sicherheitsröhre) will necessarily move inward and outward, causing similar motions on the part of the membrana tympani. These motions have been supposed by Lucæ and Schwartze to be caused by the direct aërial communication between the tympanum and the fauces, *i. e.* by the opening of the Eustachian tube at each respiratory act.

The majority of physicians suppose that the Eustachian tube is usually closed, being opened only at the act of swallowing, a view which is supported by Politzer.

The "Mechanism of Opening and Closing the Eustachian Tube," by C. J. F. Yule, is thus reviewed by Wm. Sterling, M. B., in the "London Medical Record," Feb. 18, 1874: "The author had a catheter passed into his Eustachian tube in order to compare the sensations felt in the normal ear with those in the catheterized one. He found that the sounds produced in the larynx were rendered very much louder. That the Eustachian tube opens during the act of swallowing is well known. The mechanism of the opening

of the Eustachian tube, when not complicated by swallowing, the author, experimenting upon himself, finds to be the following: —

"*First*, During the contraction for opening the tube, the velum palati does not change either its position or its shape; in fact, it remains unmoved, and further, it does not become tense, but hangs as soft and flaccid to the touch as at ordinary times of rest. (The tensor and levator palati muscles do not, therefore, participate in the opening of the tube.)

"*Second*, The only parts which do move are the posterior pillars of the pharynx; they both move inward simultaneously towards the middle line, moving from their old position from one half to three quarters of an inch. The action is steady and not spasmodic, and can be sustained for some considerable time at will. (The muscles most evidently concerned are the palato-pharyngei.) The sound which accompanies the opening of the tube is sharp and crackling, and is referred to some part of the tympanum, or, perhaps, the membrane itself. It can be easily imitated on the sheep. Then follows an anatomical description of the muscles involved.

II.

PATHOLOGY AND THERAPEUTICS.

Dr. Phillimore, in a series of remarks upon the occurrence of hæmatoma, observes that he has never found this disease unaccompanied by disease of the brain or its membranes, and furthermore, with regard to its location in the auricle, that in none of the cases under his observation has the tumor included the posterior surface of the pinna or the lobule. The note from which the above is taken appears in the "British Medical Journal" of April, 1874, and is called forth by a paper by Mr. Cobbold, which was published in the same journal in October, 1873, in which the author determined the presence of ossification and a series of Haversian canals in an ear examined by him

and affording the material for his paper. The observations of Mr. Cobbold in this respect are of interest as confirming those made by Mr. Toynbee as early as 1860, and reported in that year to the Pathological Society, substantially as follows: "The right ear was so very much thickened as to have lost its normal appearance, the only portions of cartilage which were not greatly thickened being the tragus and the thin narrow slip at the posterior portion forming the helix. Upon making a section of the cartilage it was found in some places half an inch in thickness, but not harder than natural. This thick portion of the cartilage presented no appearance of a cyst, and under the microscope was observed to consist of hypertrophied cartilage cells and intercellular matter. In some parts it was converted into true bone containing Haversian canals and well defined cells. This ossific matter was also found in the left ear, which was scarcely at all deformed, and had not passed through the cystic stage of the disease.

Dr. Harlan reports a case of malignant disease of the ear in the form of a round-celled sarcoma occurring in a girl three years of age. Two months before examination a bloody discharge was observed from the left ear, followed by pain on swallowing, and swelling about the ear, the face being drawn to the right. The appetite gradually failed from the time of the first appearance of discharge, and the child became feeble.

On examination the auditory canal was found to be closed by a firm globular polypus, with a fluctuating swelling below and behind the auricle. The removal of the polypus and a free incision behind the ear gave a discharge of sanious pus, but no dead bone could be detected; the left side of the face was much swollen, and the mouth drawn to the right on crying. The left half of the tongue was much swollen, and rough as contrasted with the right, which was normal.

The left eye was never closed, even in sleep; there was no congestion of the conjunctiva; the pupil was movable and the cornea clear and bright. The polypus was twice removed

subsequently, and the discharge from the swelling behind the ear continued. Twenty-eight days after the first examination this tumor was of the size of a hen's egg, lobulated, and having a bright red granular surface.

The upper lid of the left eye covered the eye almost entirely; the conjunctiva was congested; the whole cornea was hazy and its lower fourth infiltrated; there was also free sanious discharge from the right nostril. Seventeen days later there was a penetrating ulcer of the cornea with protrusion of the iris; the breathing through the mouth and right nostril had become laborious; and at the end of a week the patient died, apparently from exhaustion. There had been in addition to the other symptoms double convergent strabismus, which, however, diminished as the disease progressed, and had nearly disappeared on the twenty-sixth day after its appearance. After death, on removing the tumor behind the ear, the bone at its base was found roughened and eroded. The train of nervous symptoms in this case of Dr. Harlan's, taken in connection with the results of the autopsy, give it a special interest. Destruction of the inner tympanic wall and implication of the portio dura caused the earliest symptom. Paralysis of the sixth nerve increased the convergent strabismus, which was corrected, and the ball rendered immovable when the disease extended to the third nerve. The levator palpabrae was at the same time involved, and the eye, which had been widely opened, in consequence of paralysis of the orbicularis, was closed by the falling of the lid. Inflammation of the conjunctiva and cornea presented a typical case of neuro-paralytic ophthalmia due to paralysis of the fifth or its optic branch. The destructive inflammation, it is in this connection worthy of note, did not commence until after the closure of the eye from ptosis.

Prof. Wernher, of Giessen, reports at length a very rare and interesting case of pneumatocele cranii in a man twenty years of age. Four years previously, following an attack of forcible sneezing, a tumor about the size of a pigeon's egg appeared behind the right ear upon the upper portion of the

mastoid process. Slight pressure was sufficient to reduce the tumor, but it immediately returned when the pressure was removed, and seemed to fill with each expiratory movement. It increased very slowly, and when about the size of the fist could be only partially reduced. The tumor continued to enlarge, and at the time of the patient's admission to the Academic Hospital the whole of the right side of the scalp presented an enormous swelling, extending from the forehead over the temporal to about the centre of the ossipital bone, measuring in this direction 28-c.m., laterally it measured 27-c.m., and extended from the upper portion of the right mastoid process to a point beyond the vertex. The base of the tumor was broad, and its upper surface divided into three rounded prominences, at the thickest portion of the tumor the scalp being raised from the bone for a distance of from $1\frac{1}{2}''$ to $2''$.

The tumor was entirely painless and could be compressed by the finger, and the underlying bone plainly felt; on percussion it gave tympanic resonance; the movability and resonance of the tumor showed plainly that it must contain atmospheric air, as the duration of the tumor precluded the idea of spontaneously generated gas; auscultation, furthermore, gave a free blowing sound, but no emphysematous crackle. On Valsalvian inflation, the tumor slowly expanded and became more tense. The size of the tumor could be somewhat diminished by tight bandages, but always returned to its former size. The outer and middle ears were nearly normal, and the hearing not very much diminished.

The treatment consisted in the continued application of an elastic bandage, which so far diminished the tumor that a further examination of the underlying bone could be made, and this examination revealed an opening in the superior portion of the mastoid through which air made its way from the middle ear. The first active treatment was directed to the closure of this opening, which was done by including by pressure this portion of the tumor and injecting iodine. Other portions were subsequently treated in the same way, and

twenty-five days later the patient was discharged with the tumor entirely gone and the integument everywhere in close contact with the cranium. Very little pain or irritation followed the use of the iodine.

Zaufal publishes an extended report of thirteen cases of traumatic injury of the membrana tympani, the paper being characterized by the careful analysis of the causes and symptoms in each case, with the conclusions to be drawn therefrom. These may be best cited in part in the author's own words: —

The injuries of the membrana tympani result either from the action of direct or indirect force: the former are induced by direct contact of the substance causing the injury with the membrana tympani; the latter are induced by the rarefaction or condensation of the body of air on either side of the membrana tympani, or by the communication of shock transmitted through the bones of the head. The results of direct injury are excoriations of the outer or inner coats of the membrana tympani, or a solution of continuity of all the coats, as in rupture of the drum-head; and the results of indirect injury are found also in the consequent inflammation of the membrana tympani, extravasation of blood upon the surface or within the inner coats, and subsequent rupture.

The location, size, and form of the injuries resulting from direct force are dependent upon the character of the instrument, the curvature of the membrana tympani, and its inclination to the walls of the auditory canal. Excoriations are found most frequently upon the posterior and inferior portions of the membrane and directed forward and inward.

The majority of the ruptures resulting from direct force are found in the anterior half of the membrana tympani; this was the case in six out of seven, and Shaw * found the same in each of three cases reported by him and Gruber, once in two cases mentioned in his "Lehrbuch der Ohrenheilkunde." Sharp-pointed instruments thrust quickly into the

* Shaw. Boston Med. and Surg. Journal, Nov. 1868.

ear may either cause a small perforation or an extensive rupture of the drum-head; but the latter form of injury is more common where the instrument is blunt. In size the rupture may vary considerably, and where the opening is a large one, it not uncommonly becomes bridged over by new growth, leaving several smaller openings.

Injuries of the membrana tympani by indirect force are most commonly caused by excessive positive and negative variations in the atmospheric pressure. Commotio membranæ tympani with consecutive meningitis is very difficult of diagnosis where there are no immediate signs of violence.

Ecchymoses may occur only secondarily; or where they occur as an immediate result of the injury, may come from the bursting of a superficial or interlamellar blood-vessel, with corresponding differences in appearance, and in subsequent effect upon the condition of the membrane; the former dry, and are removed by natural processes with the dermoid coat, often leaving, however, an excoriation which persists for some time.

Free extravasation of blood is found mostly upon the mucous coat, showing a bright red color through the membrane under good illumination, and varying in outline according to their position.

Interlamellar blood extravasations are generally flattened, but sometimes appear as a minute point, or as a line following the distribution of the fibres of one or the other layer of the membrana propria.

The location of ruptures of the membrana tympani resulting from indirect force is determined by the locus minoris resistentiæ; cicatrices, partial atrophy, and other pathological changes which invalidate the elasticity and resistance of the membrane often locate the rupture, and in but one of Zaufal's cases could no predisposing pathological change be discovered.

The left membrana tympani was the more commonly ruptured, corresponding more conveniently to the aggressive right hand which inflicted the injury. When the right

membrana tympani was ruptured, the aggressor either stood behind his victim, or was left-handed. In a series of experiments on the cadaver, where the air in the auditory canal was compressed by means of a rubber bag, the normal membrana tympani was rarely ruptured, but frequently so where the membrane had been affected by previous disease.

The ruptures found after death by hanging, and described by Wilde, Ogston, and Littre, may also be included under the heading of injury from indirect force, because, according to Ecker's observations in these cases, the soft palate and tongue are driven so far backward and upward into the naso-pharyngeal space as to nearly fill it, producing an intra-tympanic pressure commensurate with the weight of the body. The length of the fall, the suddenness of the shock with which the noose closes around the throat, would be sufficient to produce extensive rupture. This may explain the rarity of rupture of the membrana tympani in cases of suicide by hanging, as in many of the latter cases the victim dies by strangulation, and not, as in judicial hanging, from the application of sudden force.

The form of the rupture varies, being either a narrow slit or a gaping opening; according to both Politzer and Zaufal, the latter is the more frequent form. Contrary to the generally received opinion, the amount of hæmorrhage is very small; where it is at all excessive, it is usually the result of accompanying injury of the tympanic mucous membrane, or, as Zaufal found in a case of fracture of the skull from a fall upon the head, from the rupture of large veins and arteries of the dura mater, the art. meningea media especially contributing to profuse arterial hæmorrhage from the ear. In regard to the cicatrization of the large openings, Zaufal is unable to confirm Politzer's observation of the projection of a cicatricial membrane from the mucous coat of the membrana tympani, and is inclined to the belief that the closure of the opening occurred from without. In this connection may be mentioned the observations of Gruber,* to which

* Lehrbuch der Ohrenheilkunde, p. 365.

Zaufal does not refer, in which the cicatrix is formed by growth of both the mucous and dermoid coats, a microscopic examination of the cicatrix, while showing an equal reproduction of these two coats, giving evidence of the absence of anything resembling a fibrous structure.

A rupture of the membrana tympani is in and for itself a slight injury, and may become a serious matter only through the occurrence of such complications as a suppurative inflammation of the middle ear or an injury to the labyrinth; and it should be borne in mind that the former complication following a rupture of the membrana tympani from indirect force is almost always the result of an unfavorable condition of the patient or improper treatment on the part of the surgeon.

Trautmann also reports a case of rupture of the left membrana tympani resulting from a fall from a horse, the patient striking upon his head upon the pavement, being taken up senseless with profuse hæmorrhage from the nose and left ear and dying in a few minutes. An examination with the aural speculum showed the posterior-inferior portion of the membrana tympani pressed outward and of a dark reddish color, and posteriorly to the malleus, beginning at the lower end of the manubrium and extending upward and backward, a fissure about 2½ mm. long, through which oozed a bloody serum. The right membrana tympani was normal. In default of a further examination, which was not permitted, Trautmann concluded that a fracture of the base of the skull had occurred, with division of the internal carotid, the blood escaping through the rupture in the membrana tympani; in this connection the reader is referred to the observations of Le Bail already cited. Another rupture of the membrana tympani, reported by the same author, occurred in a young man who shot himself in the mouth, with the so-called water bullet, water being substituted for the ordinary missile. Aside from the injury observed in the membrana tympani, the post-mortem examination gave evidence of the destructiveness of the means employed to destroy life. The left

temporal bone was so entirely fractured that only a portion of the upper wall of the external meatus remained attached to the squamous portion; the remainder of the bone was distributed in splinters throughout the brain substance. The right temporal bone presented the following appearance: the tegmen tympani with the entire labyrinth wall were blown away, giving a clear view of the membrana tympani; the malleus and incus were in position, the stapes destroyed, with exception of the head and a portion of the posterior crus, with the musculus stapedius; the articulation with the incus remained, and in the membrana tympani a rupture extended from the lower end of the manubrium mallei upward to the periphery, ½ mm. in width at its lower and 2 mm. in width at its upper end.

In the floor of the osseus meatus, close to the membrana tympani, was a nearly circular opening about the size of a pea.

Dr. Chimani makes an addition to the list of diseases of the external ear under the title "Aneurysma Cirsoideum of the Auricle and Meatus." Shortly after the birth of the patient, who was a strong, healthy boy, his mother noticed a small swelling, about 2 c.m. in diameter, in front of the left ear; it was soft and of a reddish-blue color. At five years of age the tumor had become as large as a walnut, and from that time until his fourteenth year increased rapidly in size, pressure and external application of astringents were of no effect, and at fifteen years of age the patient was brought to the Josephenum clinic for treatment. The tumor included the greater portion of the left half of the scalp, was soft, elastic, and slightly fluctuating, painless, pulsated distinctly, and could be diminished in size by pressure.

The integument covering it was of a bright red color and of a higher temperature than adjacent parts. The diagnosis was aneurysma cirsoideum of the Art. temporalis, occipitalis and posterior branch of the Art. auricularis posterior.

Long-continued pressure and application of astringents having proved ineffectual, repeated injections of iron chlo-

ride, some twenty in number, were made, and within a year the swelling had so far disappeared that the patient was discharged as cured. A short time thereafter, however, the temperature of the left auricle increased; it became somewhat swollen and pulsated slightly at various points. This continued until, four years later, the swelling on the posterior portion of the auricle and the subjective symptoms had so far increased that the patient again applied for relief. For his age, nineteen years, he was well and strongly developed, and with exception of the local trouble, in excellent health. The left auricle was nearly double the size of the right, of a pale red color, with exception of the more prominent portions, which were reddish-blue and dotted with small deep-red spots; the enlargement was principally an increase in thickness, the posterior surface especially being elevated above the cartilaginous base of the auricle.

The walls of the meatus were swollen, of a pale red color, and marked by dots and lines of a deeper red. The temperature of both auricle and meatus was considerably above the normal degree. By means of a stethoscope, pulsation could be plainly heard, and the Art. auric. ant. cap., the Art. auric. ant. inf., and the Art. auric. post. were enlarged, tortuous, and forcibly pulsating. The subjective symptoms consisted of headache confined to the left side, diminution of hearing in the left ear, continuous tinnitus aurium, and a sensation of heat and pulsation in the ear. The use of iron chloride being decided upon, an injection was slowly made, by means of a Pravaz syringe, of twelve drops of the fluid, to which was added soda carbonate, the point chosen for the puncture being the swelling behind the auricle. Considerable pain accompanied and followed the injection, requiring subcutaneous administration of morphine for relief.

The tumor became livid, and then of a deep-blue color. On the second day the pain ceased; on the fourth day a hard, black eschar had formed, which came away easily on the fifteenth day, leaving a deep furrow, the edges of which approximated and closed in a very short time. During the

following month two injections were made in the remaining portions of the tumor with like results, and the injection of one drop only of the fluid was then made in the meatus. This last application was followed by some inflammation of the lining membranes of the canal and the dermoid coat of the membrana tympani, but subsided under warm astringent instillations, phlebotomy being contra-indicated. The swelling on the upper portion of the canal was removed with the knife, and followed by polypoid granulations, very soft and bleeding easily; these were again removed and cauterized, and at the end of four months the patient discharged relieved of his subjective symptoms, and with considerable improvement of hearing.

Dr. C. Bail publishes an interesting monograph on the semeiological value of traumatic otorrhagia, and the conclusions at which he arrives may be briefly stated as follows: —

I. In injuries of the head the discharge of blood from the ear is by no means pathognomonic, and has absolutely no relative diagnostic value.

II. This discharge is a symptom common to several lesions of the organ of hearing, which differ as to cause, and are more or less serious in character.

These lesions are: *a*. Wounds of the external auditory canal, which generally accompany injuries to the face or lower jaw. The history of the case, the condition of the inferior maxillary articulation, and of the membrana tympani, and the integrity of the tympanic cavity, guide the surgeon in his diagnosis.

b. Injuries of the membrana tympani and mucous membrane of the tympanic cavity, which are a common accompaniment of injuries of the head, and are the result of either direct or indirect force. In these cases the progress of the symptoms enables the surgeon to decide as to whether he has to deal with a fracture, or with a simple injury of the middle ear.

c. Fractures of the petrous bone, which are accompanied ordinarily by a discharge of blood from the ear. A discharge which is in itself not pathognomonic, but which may present

peculiar conditions as to duration, intermittence, and repetition which in themselves are of great diagnostic importance.

Dr. H D. Noyes reports a case of cerebral trouble following otitis media in a man æt. forty-five, who received an injury upon the side of the head three weeks before his admission to hospital, and complained of severe pain in the ear. After admission he had otitis media which soon spread to the mastoid cells; an opening was made into the mastoid followed by the discharge of pus. At the end of a month the patient was much improved, when brain symptoms set in, and he died after being comatose several days. On examination an abscess was found in the left middle lobe, which on being opened gave exit to a considerable quantity of thick greenish pus; throughout the whole left hemisphere at its base was marked pachymeningitis and a small, oblong, yellowish-white growth attached to the dura mater over the outer part of the petrous portion of the temporal bone. Over this region the membrane was loosened from the bone. Section of the brain showed pus breaking into the lateral ventricles destroying the septum lucidum, and entering the lateral ventricle of the right side. The primary abscess was situated beneath the outer and posterior border of the left thalamus opticus. The brain substance was everywhere pale and flabby, and at many points almost diffluent. There was also extensive caries of the inner portion of the petrous bone, and the outer surface of its inner half was irregular with several small perforations.

In a lecture delivered at St. George's Hospital, Mr. Dalby presented the case of a boy ten years of age, who was admitted to the hospital suffering from a discharge from the left ear. He had been supposed to have been suffering from ague, and was admitted to the hospital on that account. Three months before, in ordinarily good health, in consequence of a severe cold, he became deaf in the left ear. He continued pretty well, with exception of the deafness, until two weeks before admission, when he had an attack of pain in the left ear, lasting for two or three days and followed by discharge, and relief from the pain. Three days later he had

a shivering fit, and this was repeated each day for a week. Shortly after the first shivering the pain in the ear returned and soon involved the side of the head. On examination there was purulent discharge from the left ear with almost entire destruction of the membrana tympani. There was much pain, especially in the region of the ear; extreme tenderness on deep pressure over the mastoid; some redness but no swelling, and no tenderness in the course of the carotid sheath. Pulse 128, temperature 99.8, tongue brown and dry. Had had little or no sleep, and lay moaning, with his hand to his head, and every appearance of blood poisoning. There was an occasional dry cough, but no abnormal sounds in the chest except harsh respiration and increased voice sounds at the apex of the right lung. On the following day the pain in the head was so severe and the tenderness over the mastoid so much increased that, notwithstanding the absence of other local signs, an incision was made half an inch behind the ear. The periosteum and bone beneath were healthy. A small opening was then made through the bone, and a probe passed freely into the mastoid cells. No discharge of pus occurred at this time, or subsequently. On the day following the pain was less, but the general condition remained unchanged. There was more shivering and an occasional cough; signs of fluid in the right pleura developed, and the boy died sixteen days later. On examination, the anterior two thirds of the r. pleura were filled with pus containing flakes of lymph; in the lower lobes of the right lung were several abscesses with ragged walls filled with foul pus. The surface of the brain was somewhat congested, but otherwise healthy; there was no thrombus of the lateral sinus. Between the roof of the left tympanum and the dura mater was a small quantity of tough lymph. The membrana tympani was gone; the tympanic cavity filled with thick pus; the ossicles necrosed and lying loose. The roof of the tympanum was carious on either surface, and the roughness on the cranial surface extended back to the sulcus for the lateral sinus, — the symptoms and the subsequent examination plainly pointing to pyæmia, the

starting-point for which was a suppurating surface in the tympanic cavity.

Ménière is of the opinion that in all cases of otorrhœa great attention must be paid to the constitution, so that scrofula, syphilis, or other constitutional disease should be treated by appropriate general measures In this lies an essential element of success in all instances. Cleanliness is a capital point, and nothing is better for this purpose than pure warm water injected with moderate force. In the early stage, when pain is present, Dr. M. suggests the use of a warm decoction of marsh mallow and poppy heads, and the application of leeches, and sometimes the application of a poultice. Later in the disease the usual astringents are employed. M. Giampiètre recommends in case of pain in such cases the instillation of a fluid containing one sixth gr. of aconitia to the ounce.

J. Patterson Cassels contributes a paper "On a Form of Disease of the Middle Ear in which the use of Alcohol is especially serviceable."

To Dr. Löwenberg, of Paris, belongs the merit of having first recommended the use of alcohol as a local application in certain diseases of the tympanic cavity.* From an experience of two years in the use of this remedy in catarrhal and inflammatory affections of the tymp., Dr. Cassells is inclined to confirm all that Dr. Löwenberg has claimed, but especially in the more advanced stages of simple catarrh when there is a lesion of the membrana tympani. This affection, according to the author, consists in a hyper-secretion by the lining membrane of the tymp. cavity unduly stimulated to increased action through causes that determine an over-abundant flow of blood to it. Under favorable conditions this condition terminates in resolution, but the hyperæmia continuing, the discharge becomes more abundant, and finally, bursting through the membrana tympani, makes its appearance as a catarrhal otorrhœa. At this stage the mucous mem-

* El. Pabellon Médico, Madrid, 1870.

brane of the tympanum is highly congested, and also hypertrophied and villous. To this condition Dr. C. gives the name polypous hypertrophy as best describing its appearance, and it is in this condition in which he has found the use of alcohol almost specific. The use of silver, as recommended by Schwartze, he considers as better adapted to more chronic cases.

Bezold contributes a comprehensive review of the various investigations on the subject of parasitic growths in the human ear; as necessary causes of these accumulations, there must be the introduction of the spores of the plants either directly from the air, or by means of the instillation of some medicament or introduction of some foreign body carrying the spores upon it; and in addition, as a still more important factor, there must exist a condition of the parts of the meatus and membr. tymp. favorable to the growth of the plant. That this proper condition is a rare one, is proved by the small number of cases of Otomykosis as compared with the extensive distribution throughout the atmosphere of the spores of such plants as are occasionally found growing in the ear.

Wreden * found that in fifty per cent of his cases the Otomykosis had been preceded by an exudative inflammation of the meatus or middle ear. Active discharge Wreden remarks is unfavorable to parasitic growth, a fact easily explainable on two grounds: firstly, that such soil is unfavorable to the development of the spores; and secondly, that they are washed away by the continued discharge. Schwartze † and Weber ‡ both agree with the statements of Wreden, but take a broader ground in considering any moist ceruminal or epidermal surface where the changes of decomposition have set in or occurred as affording favorable soil; and Mayer ‖ presents the question as to whether the mykosis may not follow

* Myringomykosis aspergillina. St. Petersburg, 1868.
† Schwartze Arch. f. Ohrenheilkunde 11, p. 61.
‡ Weber. Monatschr. f. Ohrenheilkunde 11, 1.
‖ Müllers Archiv. 1884, p. 404.

fermentation and decomposition of the cerumen, or the application of fatty substances to the ear.

Mayer has further proposed as a possible origin of extended Otomykosis the occurrence of cysts containing parasitic plants which served as the point of origin.

In the ten cases which Bezold has observed since his previous publication,* it was a noticeable point in the history that in seven cases oil had been employed as an application to the ear either recently or at some time before the appearance of the characteristic symptoms of the growth. In several of these cases oil was plainly discoverable at the time of the examination, and furthermore oil globules were found, on microscopic examination, not only enclosed in the meshes of the mycelium, but also within the delicate mycelial fibres. Wreden's twenty-four cases occurred in a clientèle of 1,600, while the ten cases of Bezold occurred in a clientèle of only five hundred patients. This increased percentage Bezold considers as largely due to the recent popularity of oleaginous applications advertised as remedies for deafness. As the oil becomes rancid it affords an excellent soil for microscopic plants, as shown by Prof. Hessling in his investigations upon articles of food, in which he found a series of growths in almond, olive, and salad oils. Böke, quoted by Bezold, lately reported two cases of Otomykosis, in both of which oil had previously been applied. In one case the patient had applied a popular remedy, a microscopic examination of which showed well-marked spores of the plant which finally attained its perfect growth in the ear. Concerning the extension of the growth to the epidermis and the excitation of the well-known symptoms which mark the true parasitic disease, Bezold agrees with other writers upon this subject who consider the initial stages as those of a saprophytous formation (analogous to the parasitic growths described by Virchon and others in gangrene of the lung), as the plant first fastens itself upon the effete epidermis and secretion in the

* Archiv. f. Ohrenheilkunde Baud v. Heft 111, p. 197.

ear, and finally pushes its roots deeper into the true lining of the canal.

This view is especially supported by observation of the progress of a case of Otomykosis in which the removal of the growth in the later stages of the disease leaves the surface beneath red, swollen, and often excoriated. The form of the plant in the majority of Bezold's cases was well-marked aspergillus, and the treatment employed consisted in the careful and repeated removal of the growth, and the use of carbolic acid as a parasiticide. As a review of the subject of Otomykosis, Dr. Bezold's paper is very thorough, and with the especial point in view of considerable practical value.

Wendt describes, as frequently found in his post-mortem examinations of the middle ear, a condition which he describes as polypoid hypertrophy of the mucous membrane. This condition occurs as the accompaniment of a mucous catarrh, in the course of which a hypertrophic condition of the mucous membrane of the tympanum is developed, accompanied by the formation of numberless polypoid growths of microscopic size, and the greatest variety of form, being of every shape, from a slight rounded elevation above the general surface, to a rounded body connected with the mucous membrane by a well-marked neck. The periosteal coat of the lining membrane was not, as a whole, hypertrophied, but the sub-epithelial coat was swollen and more or less rich in lymphoid cells; at some points cysts and cavities were discoverable, filled with fluid mucus. The polypoid prominences originated in the sub-epithelial coat. Wendt is of the opinion that these growths, when they do not subside spontaneously (several of those examined seemed to be undergoing that process), may increase until the whole cavity is filled, or, uniting in their growth, may give rise to the fibre and thread like growths which he describes in another article, being the case of a man in whom death resulted from miliary tubercle, and who had been exceedingly deaf for two months preceding his death. The examination showed that there had been a general inflammatory affection of the mid-

dle ear, of long standing, resulting in partial destruction of the membrana tympani, and in the tympanic cavity general thickening of the mucous membrane especially about the fossa of the fenestra ovalis and upon the membrane of the fenestra rotunda; there was, furthermore, union between the tympanic walls, the membrana tympani, and ossicula by means of strong bands to such an extent that the upper portion of the cavity was almost entirely isolated from the lower; the ossicula were also united to each other and to the surrounding parts by firm bands. A microscopic examination of the membrana tympani showed calcification in several places in the fibrous and dermoid coats and cellular infiltration of the mucous coat. The tympanic mucous membrane exhibited, in addition to more or less infiltration, simple hypertrophy of the connective tissue, accompanied by cystic cavities, and also general calcification, including the covering of the membrane of the fenestra ovalis and ossicula.

The same author presents an equally interesting observation, which has its bearing especially in the support of his opinion that embolism in the mucous membrane of the tympanic cavity may be the cause of sudden deafness. The case quoted was that of a girl who developed symptoms of pyæmia after an operation, and five days before death became suddenly deaf in the right ear, and two days before death lost the hearing of the left ear also.

A post-mortem examination showed that the labyrinth, auditory nerve, and internal auditory artery were in normal condition. There were some changes in the middle ear due to chronic trouble which would diminish the hearing somewhat, but not in so great a degree as was noticeable during the few days preceding death. There were, however, recent changes in that portion of both tympanic cavities which is most important to the transmission of sound, including the fenestra ovalis and fenestra rotunda, which would serve to account for the later deafness.

The epithelium was opaque and swollen, and discolored by the imbibition of the coloring matter of the blood, and con-

taining numberless red blood-corpuscles. The stapes was buried in the swollen mucous membrane, which covered also the membrana tympana secondaria. The remaining mucous membrane was hyperæmic and œdematous. Wendt considers embolism of a tympanic artery as the most rational explanation of these recent changes, a view which, even in default of the discovery of an embolus, is certainly supported by the character of the change observed, especially in the region of the fenestra ovalis and fenestra rotunda.

Dr. Frank, of Würtemberg, supports the views advanced by Weber-Liel in his work on progressive deafness by the results of an operation for cleft palate, and especially with reference to the secondary catarrhal inflammation of the middle ear, concavity of the membrana tympani, and contact of the tubal walls in consequence of relaxation of the tensor veli.

The patient, a boy sixteen years of age, had a congenital fissure of the soft palate, and suffered frequently from subacute catarrh of the middle ear. The fissure was triangular in form, and extended forward to the hard palate. The right membrana tympani was nearly normal but concave and immovable. The left membrana tympani was still more concave and also immovable. The operation completed by Dr. Frank was successful not only in closing the fissure of the palate, but also, as a secondary result, in so far restoring the normal action of the palatal muscles as to free the Eustachian tube, as was shown by the consequent mobility of the membrana tympani, and an increase of the hearing from a few centimetres to a full metre.

Voltolini has had opportunity to confirm the results of his previous experiments on Emphysema, resulting from catheterization of the Eustachian tube, in which he referred the fatal cases of Turnbull to the occurrence of Emphysema glottidis. The patient was a stout, full-blooded woman of forty-four years of age, who had been deaf for several years and suffered from severe tinnitus aurium, for relief from which she came under treatment, which consisted in the use of Weber-Liel's tympanic catheter with morphine solution. On one

occasion considerable resistance was offered to the passage of the catheter on the left side, and it was therefore repeatedly withdrawn and re-introduced, and finally followed by the air-douche, whereupon the left side of the face became suddenly swollen, and an examination gave emphysematous crackling over the left side of the face and neck down to the clavicle and especially below and behind the left ear.

Examination with rhinoscope and laryngoscope showed the following condition: The left velum was swollen from the uvula outward; the left tubal orifice was invisible on account of the swelling of the mucous membrane of the lateral pharynx wall; the left sinus pyriformis was scarcely visible; and the lateral glosso-epiglottic ligament much swollen; there was also slight swelling of the left vocal chord. On the following day the symptoms had not entirely disappeared, and the patient still complained of the sensation of pressure about the throat.

Voltolini also reports a case of living larvæ in the ear, in which considerable difficulty was experienced in their removal on account of the firm hold afforded by the mandibles of the larvæ; they were finally destroyed by instillation ot a strong solution of alum and then taken out with the forceps

Dr. Bing, in reviewing the location of perforations of the membrana tympani, has been led to certain conclusions as to the causes of the frequency of perforation of the inferior and anterior segments. The solution given by Toynbee, namely, the effect of pressure of air forced through the Eustachian tube as a predisposing cause of this peculiarity, is set aside by the author for a much more rational and satisfactory explanation of his own, which may be briefly stated as follows: Accumulation of secretion in the ear would exert pressure upon the membrana tympani; the shape ot the tympanic cavity, narrowing towards its floor, and the angle of inclination of the membrana tympani, would bring the greatest pressure upon the inferior portion of the membrane, which, being extensible, would be pressed downward

in a horizontal direction, thus subjecting it to still greater pressure, which, as the membrana tympani is implicated in the inflammatory process, would place that portion under a condition more favorable to ulceration and final perforation.

To the long list of attempts at maintaining an artificial perforation of the membrana tympani, is to be added that of Voltolini, who replaces the eyelet of Politzer by a ring-shaped canula opened on two opposite sides, — on one side the ring being completely divided, and on the other connected by a slight bridge or band. Two incisions are made, one in front of and the other behind the malleus. The two open ends of the ring are then passed through the openings, and by pressing the two halves of the ring together, it is made to enclose the malleus and keep itself in place. The two inner ends of the ring do not completely appose, and the opening in the outer half of the ring permits the passage of the sound waves to the air within the tympanic cavity. Of the conditions which render this operation difficult of performance, and of the accidents which may occur in its execution, Voltolini speaks at length in his two later papers upon the subject. In the last communication is the description of the case operated upon eight months after the operation, the canula being firmly in place, without sign of any unfavorable change in the malleus or membrana tympani, and with considerable improvement in the hearing.

Weber-Liel presented before the Berliner Medicinische Verein in December last, a case of inflammation of the mastoid cavity, which is of especial interest, not only for the method of the operation undertaken for the relief of the patient, but also on account of the symptoms accompanying the course of the disease. The patient was a man 40 years of age, who had suffered from severe pain, especially at night, during six weeks. During the day the pain diminished, but was replaced by sensation of fulness in the right ear, and vertigo. The whole region of the ear was tender; there was tinnitus aurium, a high grade of deafness, and a slight purulent discharge from the ear. The posterior wall of the right external auditory

canal was reddened, swollen, and very tender upon pressure; a small quantity of ill-odored pus oozed through a narrow slit. There was no pharyngeal catarrh, but the walls of the tube appeared to have collapsed, as it was only possible to force air into the middle ear by the use of the tympanic catheter, which gave a distinct perforation sound, and forced a quantity of their purulent fluid through the small opening in the meatus. It is evident that while there existed a perforation of the membrana tympani, this opening was not of sufficient size to allow the passage of all the secretion accumulating in the middle ear; the swelling of the meatus presented a further obstacle, and as a consequence, the inflammation had extended to the mastoid cells. No improvement having been attained by ordinary treatment during a period of eight days, and the pain steadily increasing in severity, it was decided to perforate the mastoid; and following a suggestion of Prof. Rüdinger, the point chosen for the incision was the posterior wall of the meatus, at the junction of the cartilaginous and osseous portions of the canal, at which point there was the greatest tenderness and swelling. A stout cartilage knife was employed, and easily pushed into the mastoid cavity, its withdrawal being followed by the liberation of a large quantity of most offensive pus, with great relief to the patient. The improvement, however, did not continue; on the following night the pain was again severe and the purulent discharge had diminished. The perforation was filled with a yellowish-white mass, the attempt to remove which with the forceps caused great pain; those portions removed resembled the coats of the so-called cholesteatoma. This mass was finally removed after patient bathing with soap-suds: syringing could not be borne on account of the resultant vertigo. With the continued discharge from the mastoid, the inflammatory symptoms gradually subsided, and during the day the patient was comparatively comfortable, the pain and other subjective symptoms having greatly diminished. At night, however, the pain increased, and continued until about 5 A. M. This con-

dition continued day after day, and a closer examination of the patient developed the fact that the advent of the pain in the evening was accompanied by a chill, and that the patient was subject to malarial fever. This, together with a further consideration of symptoms, led to the administration of quinine in 6 gr. doses at night, and the final cessation of the pain, and discharge of the patient.

Dr. J. Orne Green, whose observations on mastoid inflammation, published at various times, are of great interest, makes a further contribution in the report of three cases, read before the Boston Society for Medical Observation. The cases themselves, and the remarks appended to the report, are of sufficient value to warrant their being given in full.

I. — F. E., aged eight years, was seen on July 3d, 1871, at the request of Dr. E. H. Clarke, who was unable to visit her when first called. The patient, whose mother had died of phthisis, had been considered well, with the exception of slight occasional otorrhœa on each side, till some four weeks before, when she had an attack of intense inflammation of the left ear, followed by high fever, great prostration, and violent chills, which had continued daily, with increasing severity, for seventeen days. Intermittent fever had been diagnosticated, and she had been on low diet, pilules and quinine, without relief. No attention had been paid to the ear, till a gradually increasing swelling over the mastoid forced that organ on the attention of the parents.

At my visit, she was in bed, so weak that she could not move; extremely emaciated; moaning continually and screaming at the least noise or light; intelligence good; pulse 130, weak; skin hot and dry; tongue coated. Behind the left ear was a large, diffuse abscess; the left meatus was filled with pus. Under ether, and with the assistance of Dr. Mann, who saw her then for the first time, an incision, two inches long, was made over the mastoid, and six ounces of thin and most offensive pus were evacuated. The whole bone was denuded for four inches towards the vertex and one inch behind the mastoid, but was not softened at any

spot. A cloth tent was inserted, and stimulants and narcotics ordered. Examination of the ears showed both drum-membranes completely destroyed, but the tympana were free from granulations or caries, as far as could be ascertained by the probe.

For the next week she improved slowly; the chills recurred but once, although there were several times a day exacerbations of fever; the appetite improved and the pulse came down to 100. A small abscess formed over the left scapula, and was opened. On July 11th, there was a recurrence of chills, not severe, with cough and brownish expectoration, rapid respiration and accelerated pulse, apparently relieved the next day by extending the original incision downwards and evacuating the pus which had formed there. A few days afterwards, great puffiness of the eyelids and a diffuse swelling over back of neck showed themselves; this swelling of the neck gradually extended over the left side, and, after five days, an abscess formed on the side of the neck and broke. This swelling of the neck was followed by extreme distension of all the superficial veins of the face, neck, and chest, which still remains, more than two years afterwards. An attack of pneumonia now supervened, but, fortunately, was not severe; and this was followed by a post-pharyngeal abscess, which burst, and by abscesses on the opposite side of the neck, the occiput, and temple, and by facial erysipelas. The wound over the mastoid healed, but had to be opened twice, under ether, on account of fresh collections of pus; the bone was not found softened at any time. Notwithstanding all of these complications, the patient gradually improved, and, early in September, I ceased regular attendance. On October 20th she was brought to my office; she had had, in the mean time, partial hemiplegia on the right side, the opposite side from the ear-disease, together with ptosis of the right eyelid; she was then recovering from both, but there was still very perceptible weakness of the right arm and leg. She was in good health, and more fleshy than ever before. The right side of the face was

much fuller than the left, and the superficial veins were very much enlarged; there was a fistula over the mastoid, with some discharge, but no bare bone could be detected. The fistula continued to discharge, and on January 9, 1872, the parents consented to an operation, when, with the assistance of Dr. John Homans, the mastoid was exposed by an incision through the fistula, and a small opening found to communicate with the cells; the walls of this opening were carious, and at the depth of an inch, on the inner wall of the cells, bare bone could be felt. The carious walls of the fistulous opening were removed with a gouge, and warm water syringed through the tympanum; the inner wall of the cells was not touched. From this time, everything went smoothly; no bad symptoms followed the operation, and in ten days the wound had entirely healed, and the patient has remained well to the present time, as far as the mastoid is concerned; the tympana remain in the same condition as at the first report, both of the membranes being lost; and the child is subject, when she takes cold, to a slight discharge from the exposed mucous membrane.

II. *Mastoid Inflammation; Trephining of the Healthy Bone on account of Dangerous Symptoms; Recovery.*

A. A., aged sixty-five, sister of charity, seen in consultation with Dr. Geo. S. Hyde, on the 8th of June, 1872, began to suffer with severe pain in the left ear six weeks previously; one week after the pain began, a free discharge from the meatus showed itself, and continued up to the time I saw her. The severe pain in the ear was but little relieved by the discharge, and she suffered constantly with pain, referred chiefly to the mastoid, but extending somewhat over the left side of the head; with this, there had been marked constitutional disturbance, high pulse, hot, dry skin, anorexia, and, within a fortnight, frequent nausea and occasional vomiting. At no time had there been marked swelling around the ear, or headache, other than nervous, to which

she had been subject for years. There were no chills. During the whole disease, the patient had been confined to her bed, and was extremely prostrated.

Examination showed an abundant purulent discharge from the left meatus, the left membrana tympani swollen and inflamed, with a large perforation on the posterior segment, equal to one fourth of the whole membrane. The tympanic mucous membrane was granular; by Valsalva's inflation, air was readily forced through the perforation. There was no swelling, or even tenderness, around the ear or over the mastoid. The pain, which was described as dull and heavy with an occasional lancinating shoot, was referred to the mastoid. Hearing was completely lost for both watch and voice. The skin was hot and dry, the tongue coated, the pulse 120, and weak.

The severe pain in the ear and the marked constitutional disturbance pointed to an active inflammation still going on in that organ; the large perforation of the membrana tympani and the pervious condition of the Eustachian tube precluded the tympanum proper from being the seat of retained pus, and the mastoid cells were alone left as the seat of the disease. The prostration of the patient demanded immediate relief, and I advised perforation of the mastoid cells.

June 9th. — With the assistance of Drs. John Homans and G. S. Hyde, the patient was etherized, and a perpendicular incision, one and a half inches long, made over the mastoid to the bone. The tissues were of their normal thickness and not œdematous; the bone normal and without any sinus. After incising the periosteum, it was scraped aside, so as to expose the bone, and a few minute vessels were compressed and a ligature applied to the posterior auricular artery. With a triangular borer, five thirty-seconds of an inch in diameter, I then perforated the bone, on a level with the middle of the meatus, to the depth of one third of an inch, before I felt it enter the cells; on withdrawing it, about two drachms of inoffensive pus were

evacuated. With a small-pointed syringe, warm water was forced through the perforation in the bone and returned through the meatus, and this was repeated till the cavity was cleansed. A cloth tent was inserted in the opening, and the wound covered with a wet compress.

Six hours after the operation the patient was very nervous from the ether, and complained of some pain in the ear; but the pulse had come down from 120 to 108. Ordered chloroform, gtt. xx.

June 10th.—Slept well, without pain; felt much better. Pulse 88. Skin cool and moist. Appetite much improved. Tympanum syringed through wound and meatus. Allowed beef tea and an egg.

June 11th.—Passed a "delightful" night, free from all pain, except an occasional dart; took no chloroform. Pulse 88. Slight discharge of pus from wound. Tympanum syringed as before.

June 12th.—Yesterday afternoon sharp pain, as of old, felt in the ear, which continued through the night, requiring chloroform, but it passed off towards morning. Pulse 88.

June 13th.—Passed a good night; no return of the pain. Pulse 88; tongue clean. Appetite good. Directed the tympanum to be syringed with warm water three times a day.

June 15th.—No pain, except for three hours last night. Discharge from both meatus and wound slight. Sat up today for the first time for seven weeks. Directed that the ear be syringed twice a day, and a solution of sulphate of zinc (gr. i. to ℥ i.) be instilled at night.

June 18th.—Patient reported that on the 16th pain returned in the ear, accompanied by a singing; at the same time there was severe pain in the frontal region and left eye. These pains continued through the 17th. On examination, the discharge was found to be much increased in quantity. The wound was looking well, but some fibrous tissue was sloughing; tongue clean; pulse 84; abdomen tympanitic from flatus; watch not heard on contact. Omitted the in-

stillation of zinc, and ordered poultice to wound, and two cathartic pills.

June 19th.—Free from pain; slept well, and this morning bright and cheerful. Pulse 82. To douche the tympanum three times a day with warm salt water. ℞. Quiniæ sulph., gr. i., ter die.

June 20th.—Sat up all day; some pain in the ear and through the back of head and left eye for several hours, not so severe as before. Pulse 72. Appetite and strength improving.

June 23d.—Quinine omitted, on account of headache and ringing in both ears; ligature removed and poultice omitted. Ordered iron.

June 26th.—Discharge from wound and meatus diminishing; scarcely a twinge of pain.

July 7th.—Rode out for the first time. No pain; very little discharge. Membrana tympani less swollen and granulations diminishing.

July 19th.—Occasionally slight pain in ear; no discharge from meatus, and the perforation healing. Wound healed, except a small fistula, which still discharged considerably, and through which bare bone could be felt. W. l. on contact.

From this time the ear-disease progressed favorably. The membrana tympani healed perfectly, and the discharge from the mastoid opening gradually ceased. The hearing, by the first of August, had improved to W. l. $\frac{3}{4}''$. V. l. 10′. During the latter part of August, there were nausea and vomiting several times, with occasional vertigo, pain in the stomach, back, and lumbar region, and some swelling of the feet, but the patient had been subject to such attacks for years, and no disease was discovered; an analysis of the urine afforded no explanation. During these attacks of vomiting, there was a discharge of blood, in small amount, from the mastoid sinus.

I did not see the patient again till October 22d, 1873, nearly fourteen months afterwards, when she was complain-

ing of pain in the ear, due to a slight cold, and which soon passed off without treatment. She reported that, during the year, she had had no trouble with the ear, except slight and constant subjective noises. Her health had been about as good as usual; she had occasional sick headaches as ever, some chronic bronchitis, and, occasionally, a great determination of blood to the head, without known cause. During severe vomiting she had sometimes slight bleeding from the mastoid opening. Examination showed the membrana tympani without cicatrix, very much thickened, and drawn in and immovable. Over the mastoid was an opening half an inch deep and one eighth of an inch in diameter, lined with a continuation of the outer skin, which became in the deeper parts very delicate, and resembled mucous membrane; no opening existed through this into the mastoid cells. W. l. $\frac{3}{4}''$. V. l. 8′.

III. — *Mastoid Inflammation; Fistulous Opening through the Bone; Wilde's Incision; Rapid Recovery.*— C. G., aged 15, was sent to me on July 24th, 1872, with the history that two months before, during an influenza, he had had acute inflammation of the ear, with discharge. Since that time, the discharge had continued with a constant but slight pain in the ear, annoying tinnitus, and slight, constant vertigo till yesterday, when nausea and vomiting followed a marked increase in the vertigo; there had been no headache. When I saw him, the only symptoms complained of were a slight, almost constant pain in the left mastoid, with an occasional slight dart into the ear, a staggering gait, with a marked tendency to fall towards the right side, constant nausea, and occasional vomiting. The countenance was anxious; pulse 120, of fair strength; tongue clean. Examination of the ear showed a purulent inflammation of the tympanum and a perforation of the drum-membrane, with large polypoid granulations on its edges; the mastoid not red or swollen to the eye, but to the touch slightly fluctuating and a little tender. Watch not heard on contact. Extreme vertigo, with vomiting, resulted directly from the examination.

Under ether, the tissues over the mastoid were freely incised through the periosteum, and at the extreme lower part of the bone, a small fistulous opening passed into the mastoid cells; through this, thick grumous pus ran out. A tent was inserted in the wound, and douching of meatus and wound with warm water was advised. The vertigo and vomiting were immediately and entirely relieved; the pulse became normal within twenty-four hours. Four days after the operation, the patient not having been under observation, the wound was found to have healed, and the pain in the mastoid was slightly increased. On this account the tissues were again incised, under ether, and the bone, which had softened around the previous fistula, was cut through with a knife, opening the cells for a distance of a quarter of an inch; the tympanum was then syringed through the fistula. Examination of the ear, at this time, showed that the inflammation of the drum-membrane was much less, and the polypoid granulations had disappeared. W. l. $\frac{1}{4}''$.

From this time, the recovery was rapid; two days after, the discharge, both from the wound and meatus, had ceased, and the perforation of the membrane was found to have healed. W. l. 3″.

Six days after, all pain and subjective noises had ceased, and the hearing was rapidly improving. W. l. 20″.

I have selected these three cases as illustrative of the more serious forms of mastoid disease; they show the course which the disease may take, and the way nature seeks to relieve herself, and thus point out the line of treatment.

Mastoid inflammation, although never primary, is now very properly described as a distinct disease, as it is always serious, and not uncommonly fatal, from involving the brain. The mastoid cells are but a part of the tympanic cavity, lined, like the rest of the cavity, by a delicate mucous membrane, which is in such close connection with the periosteum that the two cannot be separated or even distinguished. An

inflammation of the tympanum proper usually implies, also, an inflammation of the mastoid cells of a greater or less intensity, and if this inflammation is so severe as to cause an abundant secretion of pus, an outlet for the matter from the cells can only occur by its breaking through the bone, either externally or internally, while the matter in the tympanum proper only requires to break through the delicate drum-membrane. In the majority of cases the inflammation subsides and the pus is absorbed, but in some cases the inflammation is too intense for this to occur without the evacuation of the pus, and then nature attempts to form an outlet, as is seen in the first and third cases.

An examination of macerated bones shows, on the outer surface of the mastoid, numerous openings which serve for the passage of blood-vessels into the bone, and some of these undoubtedly are in communication with the circulation of the mucous membrane. Along these vessels the inflammation is transmitted from within to the external periosteum, and, as pus is only formed in the later stages of an inflammation, the first pus formed here will be next the bone where the inflammation is oldest. The pus having formed on the external surface of the bone, it meets with very firm obstacles to reaching the skin, for the whole mastoid serves for the attachment of the sternomastoid tendon, and the pus must work its way through this very firm fibrous tissue before coming to the subcutaneous tissue. This accounts for the very extensive burrowing of pus in the first case, for three weeks, without its having formed an outlet.

In examining a large number of temporal bones, it will be seen that the thickness and consistency of the mastoid varies very much, and also that, in some, the openings on the external surface are much larger and more numerous than in others. In some bones, it is impossible to see any of these foramina. Thus another obstacle exists here to the exit of the pus; for while, in the cases just spoken of, the bone becomes inflamed, softened, and disintegrated around the opening through which the inflamed vessel or vessels pass, in the

latter cases a new opening must be formed, a longer time is required, and the patient is consequently longer exposed to the risks of retained pus. In the second case reported, it is probable that the unusual thickness of the bone (one third of an inch) and the absence or very small size of these foramina, prevented any external inflammation; and it is also probable that this is the explanation of those cases in which, after death, the inner wall of the cells next the brain is found carious, while the external wall is healthy. This second case is also peculiar, from the fact that there was no tenderness on pressure of the bone, which I can only explain by supposing that the bone was so very solid that it had not become inflamed. The operation of trephining under these circumstances is, I believe, new; but the condition of the patient was so critical that I had no hesitation in advising it. In the first case, I have no doubt that weeks of suffering and danger would have been avoided if consent could have been obtained to a similar operation.

In the treatment of recent mastoid inflammation, we can generally hope for the subsidence of the disease by the local abstraction of blood and by appropriate treatment to the original cause of the trouble, the inflammation of the tympanum proper. Two to four leeches over the mastoid will often so reduce the congestion that the disease subsides, and warm fomentations to the bone will help the resolution. At the same time, if the tympanum contains pus, this should be evacuated. As a rule, the drum-membrane will rupture of itself in a short time; but if such a rupture does not take place, the membrane should be incised to give an exit to the pus, and the drum-membrane and tympanum treated by douching with warm water and by the use of the air-douche, to keep the tympanum free from the irritating matter.

If, however, an external periostitis has been set up, a free incision should be made down to the bone, for, if pus has already formed, it should be evacuated as soon as possible to prevent unnecessary injury to the bone; and if no pus has formed, the relaxation of the swollen tissues and the bleed-

ing from the incision both relieve the pain and assist in causing the inflammation within the cells to subside. At the time of the incision, the bone should be examined to see if any fistula exists in it, and if such is found it should be exposed and thoroughly syringed out. The place at which this fistula commonly forms is of considerable importance in aiding us in our search and also in deciding where the bone ought to be trephined, in case such an operation becomes necessary. In most of the cases which I have seen, this fistula has been nearly in the middle of the mastoid, not at the extreme tip or at the extreme upper part, although in both of these places the bone is very thin.

While the fistula is being sought, the bone should be tested, and it will frequently be found to be so softened that a probe, director, or even a knife can be thrust through into the cells, thus evacuating the pus. If the bone around the fistula is softened, the opening should be enlarged till healthy bone is reached. The first case is interesting as showing how necessary the removal of the softened bone is for a cure; for here the disintegrated bone, although so fine as to escape observation with a probe, kept the wound open for several months, while the removal of the affected bone with a gouge resulted in a cure within ten days. The second case shows how long the mastoid cells may be intensely inflamed without affecting the bone, and in these cases the operation of trephining is especially indicated, as the pus, if meeting with unusual obstacles to its escape externally, is more apt to affect the other walls of the cells and cause fatal disease of the brain.

The great object of treatment in mastoid inflammation is, then, the fulfilment of the well-recognized law of surgery to give free exit to the pus.

III.

REVIEWS AND BOOK NOTICES.

A PRACTICAL TREATISE ON THE DISEASES OF THE EAR, INCLUDING THE ANATOMY OF THE ORGAN. By D. B. ST. JOHN ROOSA, M. A., M. D. Illustrated by Wood-Engravings and Chromo-Lithographs. New York: William Wood & Co. 1873.

"This work is intended to be a guide to those who wish to treat diseases of the ear."

These are the words which open the preface to this very valuable work; and after a careful examination, we believe the intention of the author has been ably carried out. The work contains five hundred and thirty-five pages, and is divided into four parts, which treat respectively of the external ear, the middle ear, the internal ear, and deaf-muteness and hearing-trumpets. There is also a very interesting and accurate history of the progress of Otology from the year 460 B. C. to the present time, which precedes the description of the anatomy of the auricle and external auditory meatus.

The directions for examining aural patients are very explicit, and the chromo-lithographs illustrative of the appearance of the membrana tympani are exceptionally good. The perspective of the lithographs in this work is strikingly brought out by viewing them through any short tube, but preferably with the ordinary aural speculum.

Among the various methods of removal of foreign bodies from the external ear the "agglutinative method," recently revived by Löwenberg in Paris, is mentioned. This method has been very erroneously ascribed lately to Dr. Löwenberg, whereas the method is most explicitly given by Riverius and Celsus, and has been put into practice in a particular instance by a layman, Mr. Eli Whitney Blake, of Whitneyville, Conn., upon a boy employed in his carriage factory. (C. Hooker, M. D., Boston Journal, 1834.)

Riverius (Riverii Op. Med. Francofurti, M. DC. LXXIV., Cap. de Surditate, p. 261) says: "Si auriscalpium intromitti nequeat specillum cotone involvatur in extima sua parte, deinde immergatur in terebinthinam, aut in aliquod aliud viscidum: post immitatur in aurem, ut agglutinet id, quod obstruit."

Celsus (edition of his works published at Strasbourg, 1806, p. 342) says: "Specillum lana involutum in refinam quam glutinosissimam, maximeque terebinthinam demittendum, idque in aurem conjiciendum, ibique vertendum est; utique enim comprehendet et eximet." These facts surely place the discovery of this method far beyond all modern claims.

Otitis parasitica, a disease which appears to be more common than heretofore supposed, is thoroughly explained by accurate wood-cuts and a fully-condensed experience of authors on this topic.

The chapter on Injuries of the Membrana Tympani shows that, although many injuries to this part of the ear arise from unavoidable causes, unskilled manipulation on the part of the laity, in their anxiety to relieve the patient, may perforate or destroy this delicate membrane, which might have been saved had the surgeon been called upon for relief. The chapters of this work which contain the author's experience and views upon chronic non-suppurative inflammation of the middle ear are the prominent feature of this treatise. The author divides the so-called chronic catarrh of the middle ear, or chronic non-suppurative inflammation of the middle ear, into — 1, *chronic catarrhal inflammation*, and, 2, *proliferous inflammation*. The latter term is original with the author, or rather it is, as Dr. Roosa says, an original translation of the German word *Wucherung*.

This endeavor of the author to differentiate the forms of chronic disease of the middle ear is in perfect harmony with similar endeavors of Politzer, Gruber, Weber-Liel, and others, the first-named of whom divides chronic catarrhal diseases of the middle ear into secretory and non-secretory forms; the second authority has described an otitis media

hypertrophica; and the last-named writer has recently published his well-known work "On the Nature and Remediability of the Most Common Form of Progressive Hardness of Hearing," which malady, he says, cannot be referred to catarrhal causes, but even as a primary disease must be considered as a disease of the structures of the middle ear dependent upon "affections of the nerves which supply, and which stand in close relation to, the middle ear." In this attempt on all sides to describe a separate chronic disease of the middle ear, based upon a special group of pathological alterations of the component parts of the tympanum, we recognize the fact that there is a frequent form of deafness which cannot be referred to catarrhal causes at all. Therefore, Dr. Roosa endeavors to describe "a form of inflammation which shows a higher formation than the catarrhal," and, while admitting that catarrhal symptoms may precede this form of disease, he shows that there is a disease of the ear which tends towards a chronic progress, and which he has "ventured to designate the *proliferous form*."

These views of the author are based upon twelve varieties of tissue-changes which have been frequently found as a consequence of this form of ear disease, and in them we find that the prominent feature of the pathological processes is the formation of new tissue; and it is this fact that has induced and really warrants the application of the word "proliferous" to this form of ear-disease.

In the chapter on the Treatment of Chronic Non-suppurative Inflammation of the Middle Ear, Dr. Roosa says, "In one respect the treatment of the catarrhal may be fairly distinguished from that of the proliferous form. In the catarrhal form we must give a great deal of attention to the naso-pharyngeal space, while in the other we need to pay very little to it." With this exception, the outline of treatment for both forms of the disease may be the following: constitutional and hygienic, local blood-letting, applications to the Eustachian tube, applications to the cavity of the tympanum,

and cutting operations upon the membrana tympani and the ossicula.

Under the head of the nasal douche the author expresses his views against its use, since he has found it to be "sometimes a troublesome and dangerous appliance."

This surely will be the case if the instrument is improperly used; but if the fluid injected into the nares *be warm, if the vessel containing the fluid be not higher than the patient's forehead, and if after using the douche the patient do not leave his room for at least fifteen minutes, we have yet to hear of any accident such as Dr. Roosa depicts.*

It is not stated, in the table which is given by the author to show the danger of the application of the nasal douche, whether *all* these rules were observed; and although it is implied that they were, still it is not clearly shown; for the instructor in the use of the douche, in thirteen cases of the sixteen unfortunate ones, is either unnamed or "unknown," and in several cases the nature and temperature of the fluid injected are also "unknown," except in one case, — that of Dr. Frank, — in which it is distinctly admitted that the injected fluid was cold, and, as we are prepared to hear, the result was an acute otitis media.

We cannot admit, as Dr. Roosa does, the statement that "the instructor in the use of the douche was a physician" as a sufficient guarantee of the correctness of the instruction, for our experience shows that as a rule the patients have failed to receive *all* of the aforesaid precautions. And even if the physicians who instruct the patients in the use of the douche give proper instruction, the patients themselves may fail to follow their directions. It is obvious where the blame rests in such cases.

Operations upon and through the membrana tympani, which now form some of the most important operations in surgery, are illustrated by history, cases, and wood-cuts of the various instruments employed, from "Cheselden's Experiments on Dogs to Weber-Liel's Operation upon the Tensor Tympani Muscle."

At the end of the fourteenth chapter we find a table showing the results of treatment of chronic non-suppurative inflammation of the middle ear, based on the observations of four observers, of whom Professor Roosa is one. In commenting on this table, Professor Roosa says, "I can only account for the fact that my percentage of *cures* is less than the others from the supposition that I have seen a proportionately larger number of neglected cases than falls to the lot of other practitioners."

We note, however, that the percentage of *improvement* in our author's cases is greater than that of the others. Dr. Roosa also states that he has made the standard of cure very high, and has not called a case "cured" which has only been greatly improved.

The chapter on Acute Suppuration of the Middle Ear serves to mark an era in the treatment of disease in general. Our author, firmly supported by the experience of modern Otology, shows that the treatment of this form of ear-disease is not only rational and successful, but is demanded, by the exigencies of the case and the evils of neglect, from every intelligent and conscientious physician. If any one should doubt the desirability of treatment in acute Otitis media, he has but to peruse the chapter on Chronic Suppuration of the Middle Ear and its fatal consequences, in order to have a good reason for changing his opinion.

"The general health of a patient affected with chronic suppuration of the middle ear is usually impaired, even if none of the serious consequences have occurred. Such a drain is not tolerated with equanimity by nature"

"Dr. Hackley has found albuminuria in a number of cases of chronic suppuration of the middle ear, where there was no apparent cause for the disease except the long-continued secretion of pus from the tympanic cavity."

One hundred pages are devoted to a consideration of the consequences of chronic purulent discharges from the tympanum, and the treatment in these very grave cases.

To this portion of the treatise Dr. Roosa has appended a

table, "compiled from various sources, which illustrates in a striking manner the fatal consequences of some cases of aural disease."

The portion of the work which treats of the middle ear and its diseases closes with these words, in reference especially to the table of cases already alluded to: "Taken in connection with the fact already stated, that suppuration of the ear is more frequently the cause of cerebral abscess than any other one disease, these cases form a complete justification, if one were needed, for the giving up so much space to the consequences of chronic suppuration of the middle ear. If the table should startle some mind hitherto inattentive to this subject into a realization of its grave importance, and lead to a more careful consideration of an ulcerated middle ear, it will have accomplished its object." The remaining pages of the book are devoted to the anatomy and diseases of the internal ear, and to deaf-muteness and hearing-trumpets.

True nervous deafness, "a primary affection of the auditory nerve or labyrinth, or of both," is said to be a rare disease. In fifteen hundred cases of aural disease observed by the author, only fifty-seven could be fairly considered as primary diseases of the internal ear. C. H. B.

Diseases and Injuries of the Ear. By W. B. Dalby, F. R. C. S., M. B. Cantab., Aural Surgeon to St. George's Hospital.

This book, of little more than two hundred pages, is divided into eleven short lectures on the more important features of "Diseases and Injuries of the Ear." Among the lectures we would single out the fifth as the best, if called upon to make any distinction; but they are all very good, and contain the substance of the diagnostic and therapeutical knowledge of the day so far as it pertains to Otology. The anatomical and physiological facts are but lightly touched upon; we suppose, because the author relies upon a preliminary knowledge on the part of those who constitute the class at St. George's Hospital.

In the fifth lecture, already mentioned, the diagnosis and treatment of non-purulent catarrh of the middle ear are carefully and clearly set forth, and furnish, therefore, a very valuable guide to any one who has to treat a case of this disease.

The subject of aural polypi is very thoroughly treated in the seventh lecture, accompanied by some "beautifully executed drawings, showing the structure of these bodies, by Dr. Whipham." Under this head we notice that Dr. Dalby recommends the use of "fine fishing-gimp" instead of wire in the formation of the snare in Wilde's instrument. "After the removal of the polypus," Dr. Dalby says, "I am in the habit of using chloroacetic acid on a small camel-hair brush, and apply it very freely. At the same time, care must be taken not to touch any part of the meatus."

Those parts of the book which relate to mastoid diseases, to the obscure nervous affections of the auditory apparatus, both acquired and inherited, and to deaf-muteness, are full of interest; but we think more should be said concerning mastoid disease and its treatment, even at the expense of space which is given to deaf-muteness. So much has been done for the relief of mastoid disease, and it now constitutes so important a part of the aural surgeon's work, that no book on diseases of the ear is complete without a very thorough review of the diagnosis and treatment of this important and tractable malady, while deaf-muteness hardly falls within the province of the aural surgeon, at least not to the exclusion of more remediable troubles of the ear.

The great importance of chronic discharge from the ear is acknowledged and most forcibly enjoined in the following words, which close the eighth chapter: —

"But inattention to the discharge may at any time place the patient in a position of great peril. For this reason I believe that a discharge from the ear is regarded by insurance companies as an element against granting a policy, or, at any rate, demanding an increased premium. I can only say that, if it is not so regarded, it would be, if the companies consulted their own interests."

We can but terminate this short sketch by saying that the perusal of this book has been not only instructive but extremely pleasurable, and we are glad to acknowledge the addition of such a volume to the literature pertaining to Otology. C. H. B.

Die Corrosions Anatomie und ihre Ergebnisse. Hyrtl. Vienna, 1873.

Hyrtl describes the casts taken from the labyrinths of a variety of animals.

1. That of *Troglodytes Grilla* is remarkable for the size of its posterior semicircular canal and ampulla; it resembles very closely that of the orang.

2. The *Aye-Aye* (Chiromys madagascariensis) is commonly classed with the sciuridæ; but its labyrinth is so entirely like that of the lemuridæ that Hyrtl does not hesitate to place it in the latter class.

3. *Ursus spelæus*, the cave-bear of the glacial drift. There is great difficulty in getting rid of the clay and sand that is packed into the aural cavities of pre-historic animals.

H. boils the temporal bones in vinegar for several hours, then dries them by a strong heat, and pounds the bone on some hard object to get the fragments out; this process must be repeated three or four times. The cavities are then to be cleaned by means of bristles, for introducing which he makes artificial openings at the cupola of the cochlea and the middle of the semicircular canals. The labyrinth of this bear is only distinguished by its size from that of the modern brown bear (U. arctos).

4. *Hyæna spelæa*, the cave-hyæna. Its labyrinth unites the characteristics of the viverræ and the cats.

5. *Trichecus rosmarus*, the walrus. The labyrinth differs from those of the other palmipeda in being somewhat smaller; it has much wider semicircular canals, and a monstrous, broad, low cochlea, with rather less than $2\frac{1}{2}$ turns.

6. *Latax stelleri*. The labyrinth is widely different from

that commonly found in seals; the semicircular canals are very narrow, and are placed somewhat as in the fish-otter.

7. *Rhinoceros tichorhinus.* There is only one point of distinction between this labyrinth and that of Rh. africanus, namely, the corkscrew shape of the aquæductus and cochlea; there is also great similarity to that of the one-horned Rh. indicus.

8. *Camelopardalis giraffa.* Very close resemblance to the cervina; much less to the antelopes. The preparation in the Musée Orfila at Paris shows an S-shaped bend of the upper canalis semi-circularis, which has been found to be due to the distorting effect of the acid used for corroding the preparation.

9. *Chelonicus gigas.* The organ of hearing is exactly like that of the armadillos; the labyrinth shows also an affinity with that of the hedge-hog.

10. *Physeter macrocephalus*, the sperm-whale. The labyrinth combines the peculiarities of the herbivorous sirenidæ and of the phocæ; it is totally unlike that of the great baleen whales, and in all respects smaller than that of Balæna mysticetus.

11. *Orcinus orca.* This creature is ranked with the phocænæ, but possesses the labyrinth of the narwhal; there is a great resemblance between this specimen and the labyrinth of the delphinidæ.

12. *Balæna mysticetus*, right-whale. The cochlea is the largest in Hyrtl's possession, though it must be called small in comparison with the gigantic size of the beast. It makes two turns, not touching one another, in the same plane. The modiolus is excessively thick, and its axis points directly downwards, which is the case with no other order of mammals. The canales semi-circulares are proportionally very small, not larger than in the domestic rat. It is a general law that their size is inversely proportional to the density of the temporal bone, and this bone, in the case of the right-whale, is hard enough to give a spark with steel, and is perfectly inaccessible to the ordinary methods of anatomical research with knife and chisel. C. J. Blake.

Index to the articles mentioned in the Report, arranged in alphabetical order of the authors' names.

INDEX TO PART I.

Blake, C. J. Description of a peculiarity observed by Prof. Wyman in the crania of Hawaiian Islanders and Peruvians. Boston Society for Advancement of Medical Science.

Breuer, J. "Ueber die Bogengänge des Labyrinths." Anzeiger der Ges. der Aertze in Wien. Nov. 20, 1873.

Breuer, J. Ueber die Function der Bogengänge des Ohr-labyrinths. Wiener med. Jahrb. 1874. Heft 1.

Buck, A. H. "On the Mechanism of Hearing." Prize essay of the Alumni Association of the College of Physicians and Surgeons, New York, March, 1874. Published in New York "Medical Journal," June, 1874.

Burnett, Charles H The Resonant Functions of the External Ear. Phila. "Med. Times," No. 127, Vol. IV, 1874.

Burnett, Charles H. The External Ear a Synthetic Resonator. Phila. "Med. Times," No. 101, Vol. IV, 1873.

Curschmann, K. Ueber das Verhältniss der Halbcirkelförmigen Canäle des Ohr-Labyrinths zum Körpergleichgewicht. Vorläufige Mittheilung. Deutsche Klinik, No. 3, 1874.

Cyon. Ueber die Function der halbeirkelförmigen Canäle. (Archiv für Physiologie von Pflüger. Dec. 1873. Bd 8. Heft 6 u 7.)

Gruber, Prof. J. Ueber Anomalien in der Verbindung des Hammers mit dem Trommelfell. M. f. O. April, 1874.

Hasse C. Die Lymphbahnen des inneren Ohres der Wirbelthiere.

Küpper. Ueber clonische Krämpfe der Schlingmuskeln. (Quoted from M. f. O. No. 9, 1873.)

Kessel. Ueber den Einfluss der Binnenmuskeln der Paukenhöhle auf die Bewegungen und Schwingungen des Trommelfells am todten Ohre. Archiv. f. O. N. F. Band II, p. 80.

Lucæ, A. The Power of Accommodation of the Ear and its Disturbances. Berlin Klin. Wochensch. No. 14.

Mach und Kessel. Die Function der Trommelhöhle und der Tuba Eustachii. Sitzb. d. k. k. Akad. d. Wiss. J. 1872.

Mach und Kessel Versuche über Accomodation des Ohres. Sitzb. der k. k. Akad. der Wiss. Jahrg. 1872.

Mach, Ernst. Gleichgewichtssinn des Menschen. Wiener Sitzungsberichte. Nov. 6, 1873.

Mayer, Prof. A. M 1. Functions and Mechanism of Audition. 2. Duration of the Sensation of Sound. 3. Reflection of Sound from Flames and Heated Gases. Proceedings of the Academy of Sciences. Washington, April 21, 1874.

Michel, C. Das Verhältniss der Tubenmündung zum Gaumensegel, am Lebenden betrachtet durch die Nase.

Trautmann. Die Lichtreflexe des Trommelfells. Archiv. f. O. N. F. B. II. p. 1. 1873.

Urbantschitsch. Beiträge zur Anatomie der Paukenhöhle. Archiv. f. O. N. F. Band II. p. 50. 1873.

Voltolini, R. Zur pneumatischen Ohren-Lupe. No. 2. M. f. O. Dec. 1873.

Yule, C. J. F. Mechanism of Opening and Closing the Eustachian Tube. Journal of Anatomy and Physiology, by Humphrey and Turner. No. XIII. Nov. 1873.

Zuckerkandl. Beitrag zur Anatomie des Schläfebeins. M. f. O. Sept. 1873.

Zuckerkandl. Zur Anatomie und Physiologie der Tuba Eustachiana. M. f. O. Dec. 1873.

INDEX TO PART II.

Bezold. Pilzbildung im Ohre. Monatschrift f. Ohrenheilk. July, 1873.

Bing. Zur perforation des Trommelfells. Wien Med. Zeitung. No. 35. 1873.

Cassels, J. P. Alcohol in Otitis Media. "London Lancet" April, 1874.

Dalby. Cerebral Abscess from Otitis Media Purulenta. British Med. Journal. Mar. 1874.

Frank. Schwerhörigkeit geheilt durch Staphyloraphie. Monatschr. f. Ohrenheilk. Aug. 1873.

Green, J. Orne. Mastoid inflammation. Boston "Med. and Surg. Journal"

Gruber. Zur Casuistik der Eitrigen Mittelohrentzündung mit Lähmung des Nervus Facialis. Monatschrift f. Ohrenheilk. Oct. 1873.

Harlan. Malignant Disease of the Ear. "Philadelphia Med. Times.' Dec. 1873.

Le Bail. Valeur semilogique de l'Otorrhagie traumatique. Paris. 1873.

Ménière Otorrhœa. "Jour. de Medicine." No. 9630.

Noyes, H. D. Cerebral Abscess from Otitis Media Purulenta. "Medical Record." No. 193.

Phillimore. Notes on Hæmatoma of the external ear. "British Med. Journal." April, 1874.

Voltolini. Emphysem bei Catheterismus. Monatschrift f. Ohrenheilk. Oct. 1873.

Voltolini. Lebende Larvæ im Ohre. Monatschr. f. Ohrenheilk. Nov. 1873.

Voltolini. Die Ringförmige Canula zum offenhaltung künstliche Perforation im Trommelfelle. Monatschrift f. Ohrenheilk. Mar. 1874.

Weber-Liel. Fall von künstlicher Perforation des Warzenfortsatzes v. Gehorgang aus. Deutsche Klinik. No. 5. 1874.

Wendt. Polypöse Hypertrophie der Schleimhaut des Mittelohrs. Arch. fur. Heilk. 3 and 4. 1873.

Wendt. Secundäre Veränderungen der Schleimhaut im Mittelohr. Ibid.

Wendt. Ueber einen wahrscheinlich Embolischen vorgang in der Schleimhaut der Paukenhöhle. Ibid.

Wernher. Pneumatocele Cranii. Zeitschrift für Chirurgie. Dec. 1873.

ULTIMATE FORMS OF GRANULATION TISSUE IN THE EAR.

BY ALBERT H. BUCK, M. D., OF NEW YORK.

GRANULATION tissue, when developed in the middle ear or external auditory canal, usually follows, if left to itself, one of the following courses: —

First, it may continue to develop until, finally, by its size alone, it creates such alarming symptoms that the destruction of the mass becomes necessary. During the progress of its growth, only a portion of the cells — whatever their origin may be — go to build up tissue; the majority are cast off from the surface of the mass in the form of pus. A certain proportion of these masses will be found to possess, at a certain stage of their growth, a covering of skin or of mucous membrane, according to the locality in which they originate. Probably a large proportion of them, however, consist of simple granulation tissue without any covering of skin or mucous membrane.

Second, it may remain for an indefinite period of time in a condition of nearly absolute inactivity, so far as increase in size or apparent change in texture is concerned.

Third, it may be cast off from its nutrient base by the wasting away of its pedicle.

Fourth, it may assume one of the following ultimate forms or conditions: —

(*a.*) It may become covered with skin or mucous membrane, and remain in a quiet condition, like the adjacent normal tissues. The mass then simply represents a localized hypertrophy of the subcutaneous or submucous connective tissue, and in consistence is the same as or a little harder than the normal tissue.

(*b.*) It may become covered with skin and then undergo what I might call horny degeneration.

(*c.*) The mass may become covered with skin or mucous membrane, and its central portions undergo a change into true osseous tissue.

In the present paper, it is simply my purpose to place on record the histories of a few cases, which serve as illustrations of these ultimate forms of granulation tissue.

The simplest example of the first form is one in which a broad, flattened mass of granulations ceases all active growth, becomes covered with skin or mucous membrane, and remains, with more or less diminution in size, as a flattened, rounded knob or elevation in the external meatus or in the tympanum. Instances of this are so familiar to all aurists that it is unnecessary to say anything further regarding it in this place.

In regard to the last form, it would be difficult, particularly in this locality, to determine whether a real transition from granulation tissue to bone takes place, or whether simply the local irritation assumes a new phase, the cellular hyperplasia or formation of granulation tissue ceasing, and bone being formed instead. As the subcutaneous and submucous tissues in the ear are at the same time periosteal coverings, it is rather a matter of surprise that osseous formations are so rare.

The following case seems to have been one of the kind here referred to: —

Case I. P. N., æt. 28, male, healthy. Nov. 1st, 1871. Otorrhœa from right ear since childhood. Five years ago Dr. Roosa, of this city, removed a polypus from the ear. Again, three years ago, Dr. R. was obliged to operate for the same trouble. At the present time the patient fears that another growth may have formed in the ear. On inspection the following condition of things is found: Two uniformly red, smooth, hemispherical masses, moistened with a moderate amount of pus, are visible in the right meatus. The outer one of the two is quite near the external orifice, and springs from the inferior and posterior wall of the meatus by a broad base. The deeper mass springs from the upper and anterior wall, and rests with its summit against the opposite tumor. These two growths, together with quite a small one, situated in the median line above, so encroach upon the calibre of the external meatus, that an ordinary silver probe can scarcely be made to penetrate beyond them. By Valsalva's experiment, pus can be forced through this narrow channel from within. By aid of a tenotomy knife it is ascertained that these tumors are bony in their nature and covered by a very thin layer of skin. They are very slightly tender and possess very smooth surfaces. Discharge offensive in character. No complaint of pain.

In this case, after the removal of the polypus or mass of granulations, five and three years previously, the local irritation seems to have spent itself in the formation of bone, no signs of superficial proliferation of tissue being visible at the time I saw him.

With respect to the second change mentioned, the marked hardening or horny degeneration of the tissues, it is sometimes possible to follow out this transformation from the beginning to the end. So far as my own observation goes, the change occurs only in granulation tissue which springs from a surface of skin. The following cases are illustrations of this form: —

Case II * K. C., female, æt. 25. Aug. 30, 1871. Otorrhœa from left ear during the past three years. Examination reveals a fleshy mass protruding from the external meatus. Four distinct polypoid masses removed in succession with Blake's snare.

Sept. 6 Tendency to return. Snare again used and the stumps cauterized.

Sept. 23. Two of the stumps — situated opposite to each other, one on the upper, the other on the lower wall of the meatus — have coalesced so as to form a distinct pillar-like bridge of flesh from the upper to the lower wall of the meatus. Moderate pressure with the probe is insufficient to break the union. Purulent discharge now very slight.

Oct. 4. The column perceptibly diminishing in diameter; very little discharge.

Dec. 6. The fleshy column is now reduced to a slender fibrous cord, which feels like parchment when touched with the probe. Its diameter is nearly equal to that of the smallest violin string.

Case III. L. H., female, æt 26. Dec. 1, 1873. More or less deaf since childhood. On the left side, history and appearance of chronic purulent inflammation of the middle ear. On the right side, the watch is heard only when pressed against the ear; no discharge since childhood. An examination with the speculum and reflected light reveals the following condition: Meatus normal. At the visible end of it is a smooth, parchment-like membrane of slight but uniform concavity outwardly. It has a semi-translucent appearance, with no evidence of being provided with vascular supply; is tough and decidedly thicker than the membrana tympani. When pressed against with the probe, it yields with a cracking, parchment-like sound, which is audible even to the by-stander. It is continuous with the skin of the meatus at all points, and might readily, upon superficial observation, be mistaken for the membrana tympani, did it not occupy a

* A case almost precisely like this will be found reported by Dr. Geo. T. Englemann in Vol VI, page 203, of the "Archiv. für Ohrenheilkunde."

position somewhat too near the outer orifice, and were not the handle of the hammer wanting.

After a free crucial incision through this membrane, its distance from the plane in which the membrana tympani should lie was estimated to be about a line. The red and succulent mucous membrane of the promontory was all that could be seen beyond. As an evidence of the vitality of this false membrane, at the end of the examination a glistening border of bloody serum was noticed along the cut edges of the triangular flaps.

The improvement in the hearing, at least for conversation, was quite marked, while for the watch, it was increased to a distance of four inches.

At the next visit, a week later, the patient reported that there had been a constant discharge from the right ear since the day following the operation. The perforation was then circular in shape, at least three millimetres in diameter, and through it the relations of the deeper parts could be distinctly made out. It was thus ascertained that the handle of the hammer was still entire, though adherent to and covered up at its tip by the tissues of the promontory. The short process of this ossicle could be distinctly recognized at the inner edge of the base of the false membrane, now a simple constriction with sharply-cut edges.

When last seen the patient still complained of a slight muco purulent discharge, and no marked change had taken place in the condition of the parts.

Case IV. J. S., male, æt. 12, healthy, July 9th, 1873. Three years ago scarlet fever. Parents have never noticed any discharge from the ear (L), nor has the boy himself, until quite recently. An examination reveals the existence of a polypoid mass springing from the anterior upper portion of the meatus close to the outer orifice. After it had been removed with the snare there was brought to view a dark body, which proved afterwards to be a prune pit of moderate size. Neither the boy nor his parents could account for its presence in the ear. That portion of the meatus corresponding to the greatest breadth of the pit appeared to be dilated, while just beyond and just this side of it the soft parts of the canal seemed to be swollen. The patient returned nine days later. The inner end of the dilated region was then the seat of a ring-shaped mass of granulations, which encroached very considerably upon the calibre of the canal.

Patient returned again at the end of sixteen days (August 4th). The mass of granulations had then nearly obliterated the calibre of the canal at this point, distant not more than two lines from the membrana tympani. Crystals of chromic acid applied to the centre of the mass.

August 11th. Two repetitions of the caustic application since last note, the last being followed by pretty severe pain, requiring for its alleviation the application of leeches behind the ear.

August 2d. No discharge during the past few days. On examination the meatus is found to be entirely occluded by the growing together of the opposite surfaces of the annular constriction. The tissues are pretty firm, dry, and covered apparently by true skin. At one point, about in the centre of the *cul de sac*, there is a small scab, about the size of the head

of an ordinary pin. After this had been torn off, the probe could readily be forced through to the broader passage beyond.

Efforts at dilatation were kept up for the following two or three days, but they caused considerable pain and proved of no avail.

August 28th. To-day the stricture will barely admit a small-sized probe. Applied to it fuming nitric acid, which caused only moderate pain.

October 4th. The single application of nitric acid resulted in a very marked enlargement of the constricted portion, and since then the contraction of the tissues has taken place in a centrifugal instead of a centripetal manner, as before.

October 25th. Continued enlargement of the calibre of the canal at the constricted portion. No treatment beyond simple syringing with lukewarm water.

November 22. Otorrhœa has entirely ceased. The meatus is nearly normal in size at the former seat of constriction. A small perforation in the central lower portion of the membrana tympani still remains.

Cases III and IV seem to me to throw light each upon the other. Until I had seen Case IV, and watched its rapid progress towards the formation of a false membrane, completely occluding the meatus, I was still puzzled to understand how the membrane in Case III had originated. On the other hand, I felt confident, while observing Case IV, that the process would surely lead to the same result as that observed in Case III, unless checked by active interference.*

The cases here narrated constitute in reality only one group of the second class (*b*) of ultimate forms. After the reading of the present paper, Dr. Clarence J. Blake of Boston gave the Society a brief account of several cases of horny growths, which had come under his notice. In these the tumors were really horny in character, resembling quite closely the cornua cutanea. To a still different group of this class belongs the case reported by me in the "Medical Record" for October, 1871, under the title of "Horny Growth of the Membrana Tympani."

---

* Since the meeting of the Society in Newport, I have learned from Dr. Francis Simrock of this city that he has already seen three cases very similar to Case III. In one of the three, the false membrane occluding the meatus occupied a position much nearer the external orifice than it did in the case which came under my notice.

CASE OF OTITIS MEDIA PURULENTA WITH SINUS OPENING INTO THE PHARYNX.

BY A. MATHEWSON, M. D., OF BROOKLYN, N. Y.

THE case is presented as having features of peculiar interest, differing from those of any other I have met or seen reported

S. P. G., æt. 32, farmer, of strong constitution, and free from any constitutional disease, presented himself May 7th, 1873, with the usual symptoms of Otitis media purulenta of acute character affecting the right ear. The membrana tympani was red and swollen, and had a small perforation near its centre, through which *thick creamy pus oozed.* He complained of severe pain, referred rather to the occiput, and extending over the corresponding side of the head even to the vertex, than to the ear. The hearing distance was $\frac{1}{36}$ for watch, and he readily understood a low conversation at four or five feet. Besides the severe pain there were no cerebral symptoms. His general condition was that of a naturally healthy and vigorous man depressed by long-continued suffering.

The previous history of the case was that six months before a severe pain had come on in the right ear, and lasted nearly a week before any discharge appeared. The discharge was at first very little, and the pain was not much relieved on its appearance. After a time, according to his account, the parts around the ear became much swollen, and painful to the touch.

When I first saw him this swelling and sensitiveness had disappeared.

Other means having failed to give relief to the harassing pain, a free incision was made over the mastoid, and through its periosteum. The relief was but temporary, though the incision was kept open for some weeks. The patient had spoken of having had a sensation as of a discharge of matter into the throat, and one day on examination pus was

seen issuing from a sinus opening to the outer side of the right tonsil through the anterior palatine arch.

On pressing with the finger against the mouth of this sinus the pus was forced in large quantity into the external meatus, apparently through an opening in the lower wall of the meatus close to the membrana tympani.

On repeated trials with probes and fine bougies, it was found impossible to follow the sinus either downward from the ear or upward from the throat.

The pus also came freely into the meatus when the patient stretched his mouth widely open, and after a time it was discovered that pressing against the side of the neck, below the mastoid process, caused a copious discharge into the meatus.

It seemed as if the pus, burrowing downward and backward from the ear as well as forward, had formed an abscess deep among the tissues of the neck. No fluctuation could be made out, and there was no external swelling, but the impression that there was an abscess at this point was so strong that on July 1st, 1873, I made an incision downward from the posterior part of the mastoid, carrying it by careful dissection as deeply as it seemed prudent. No abscess was reached. This incision was kept from closing for some weeks with the hope that the abscess might open into it, and a more direct and dependent way for drainage and medication might be thus afforded. This hope was not realized.

The patient still suffering severely from the pains in the head, by the advice of Dr. Agnew and others, who saw him in consultation, the mastoid was trephined August 28th. An instrument $\frac{5}{16}$ of an inch in diameter was used, and entered an inch from the external meatus, on a level with it, and directed somewhat forward. A button of bone five eighths of an inch in length was removed, and only at that depth were reached cells large enough to be felt with the probe. No pus was found, but the bone removed had the appearance of having undergone inflammatory changes, as if the mastoid cells had been filled up by a process of hyperostosis.

There were no unfavorable symptoms resulting from the operation, and the patient had partial relief from the pain for a time. Shortly after the operation he returned to his home in the country, and I did not see him again till last spring, when he presented himself entirely well, the discharge both from the throat and ear having ceased, the perforation of the m. t. closed, and the pain passed away. The man was in the highest state of general health.

The history of the case subsequent to the time I had seen him was that, though there had been some relief from pain for a while after the trephining, it became worse again during the fall, large doses of morphine affording the only relief. The discharge became more abundant from the ear, and from the sinus into the throat, and the pains extended downward along the spine. He became bent forward and unable to straighten himself, and the right arm was for a time partially paralyzed. This was about the last of November. The pains along the spine were relieved apparently by counter-irritation. In January the discharge from ear and throat suddenly stopped, the pain ceased, and the patient rapidly recovered from the depressed condition to which his sufferings had reduced him.

A CASE OF AURAL POLYPUS HAVING A CARTILAGINOUS AND OSSEOUS BASE. REMOVAL OF THE POLYPUS, THE CARTILAGE, AND A PORTION OF THE BONE. ARREST OF THE DISCHARGE AND IMPROVEMENT TO THE HEARING.

BY OREN D. POMEROY, M. D., N. Y.

Miss T., æt. fifteen years, has had a discharge from both ears, dependent on an attack of scarlatina ten years since, and which has continued with brief intermissions until the present time. The right ear has a small mucous polypus situated near the membrane, on the superior portion of

the external meatus. This was destroyed in about eight or ten days by the application of a strong solution of nitrate of silver. The patient was then etherized, and the operation done on the left ear. The meatus was found to be filled with the polypus, except for a distance of 3''' or 4'''. On touching the tumor with a probe, the surface felt soft and yielding like the ordinary mucous polypus, but on firm pressure a more or less solid portion could be easily felt beneath. The polypus was removed by a stout pair of forceps. It was found to be quite superficial. Beneath this a substance of cartilaginous hardness was discovered. For the removal of this, which was done with some difficulty, a pair of bone forceps was used. A bony substance was then reached, which was removed to a distance of about one half the depth of the canal by means of the same instrument, when so much violence had become necessary that it was thought prudent to desist from further manipulations. Very little reaction resulted from the operation, until about the fifth day, when a diffuse inflammation of the external meatus, extending to the mastoid, had resulted. The canal was much swollen, and the region of the mastoid was swollen, red, and pitted on pressure.

Severe pain accompanied these symptoms. Three leeches applied to the mastoid subdued the inflammation, and the accompanying pain, in the course of the next few days.

At the termination of the operation a somewhat broad and flat surface of bone could be discovered, but without any opening leading to the tympanum. The recovery from the operation was unaccompanied by discharge, except a small quantity of serum mixed with blood. The tissue of the external canal has closed in upon the bony remains of the tumor, leaving a smooth and dry dermoid surface, which forms a sort of cul-de-sac to the meatus. Previous to the operation the discharge was very offensive, and occasional attacks of otitis occured. The hearing before the operation was about two inches for the voice. Six weeks after, the hearing was about twelve inches for the voice, making so

satisfactory an increase as to discountenance further attempts at operation. During efforts to inflate, air is felt to enter the tympanum.

The severity of the inflammation resulting from the above procedure certainly would cause one to hesitate about repeating an operation of this kind, as the patient's life may have been endangered thereby.

The process by which this tumor was produced was undoubtedly a proliferation resulting from the chronic inflammation which had undoubtedly existed since the attack of scarlatina ten years before. The patient still remains without discharge and the improved hearing continues.

MECHANICAL VALUE OF THE DISTRIBUTION OF WEIGHT IN THE OSSICULA.

BY CLARENCE J. BLAKE, M. D., BOSTON.

The object of the examination into the weight of the ossicula has been to determine what, if any, bearing the distribution of weight, in the malleus and incus especially, may have in favoring the transmission of sonorous vibrations, particularly the short waves of the higher musical tones.

The first step would naturally be the determination of the average weight of each bone as a whole; the second, the determination of the distribution of the weight on either side of an axial line of vibration. The weight of the ossicula, as may readily be supposed, varies greatly with age and with the individual; and not only this, but the proportionate weight of the ossicula, one to another, is by no means constant.

In the new-born infant the proportionate weight of the malleus to the incus may be generally stated as 20 to 17, and in a malleus weighing 20 millegrammes, the weight would be distributed as follows: the capitulum mallei, including that portion of the neck just above the processus brevis, 16 millegrammes, the processus longus, including the processus brevis,

4 millegrammes. In an incus weighing 17 millegrammes, the corpus incudis, including the processus brevis and the base of the processus longus as far downward as the lower lip of the inferior articulating surface, 14 millegrammes, and the processus longus, with the os lenticulare attached, 3 millegrammes, the corresponding stapes weighing very nearly 4 millegrammes.

In the adult, the weight of the malleus and incus are, as a rule, more nearly equal; in some cases, however, the proportionate weight of the malleus to the incus is as 7 to 8.

To determine the distribution of weight in the adult ossicula, the bones were carefully measured in situ, and a line drawn from the centre of the processus brevis across the corpus incudis and base of the capitulum mallei to the base of the processus gracilis,— this line corresponding to the axial line of vibration in coincident vibration of the malleus and incus. The bones were then removed from their attachments and carefully prepared to remove all soft tissue, and a section made along the line drawn, by means of a hair-saw, the bone-dust resulting from the section being preserved and weighed, and its weight distributed equally between the two portions of the bones in making the subsequent estimate.

Taking one of the specimens as an example, in which the malleus weighed 21 millegrammes and the incus 25 millegrammes, the combined weight of the portions of the malleus and incus above the line of section was 30 m. g.; that of the portions below the line, 16 m. g.* This proportion of weight of the superior to the inferior portions of the bones, namely, 15 to 8, was found to pertain pretty constantly in all the normal specimens examined; and the preponderance of weight of the portions of the malleus and incus above the line of section over the portions below the line was, at any rate, sufficiently marked to show the effect which it would have as a counterbalance, mechanically speaking,

* In this case, also, the membrana propria was removed, and, separated from its osseous attachment, was found to weigh 5 m. g.

when, under tension of the musculus tensor tympani, for instance, the two bones would be so placed as to vibrate most readily upon the axial line.

In this connection reference to the contributions of Helmholz on the "Mechanism of the Ossicula" * shows that the section, to represent accurately the distribution of weight in the counterbalance, should not be made upon a horizontal plane, but at a sufficient angle to include the ligamentum externum, the plane of section from within outward corresponding to a line drawn from the axial line marked upon the inner surface of the bones to the insertion of the ligamentum externum. "The contraction of the musculus tensor tympani simultaneously stretches all of the bands which hold the ossicula in position.

"Firstly, it draws the processus longus of the malleus inward, and with it the membrana tympani, at the same time its contraction affects the axial ligament of the malleus, which it stretches inward; the capitulum mallei is drawn away from the incudo-tympanic articulation, and the capsular ligament and posterior ligament of the incus rendered more tense, and the short process of the incus withdrawn from contact with the tympanic wall. By this means the incus is drawn into the position in which the ratchet-teeth of the articulation with the malleus have the strongest hold." †

It is under the above described conditions that the preponderance of weight in the upper portions of the malleus and incus, acting as a counterbalance, serves to increase the delicacy of a mechanism which responds to sound-waves in excursions so infinitesimal that, to again quote Helmholz, the highest power of the microscope cannot render them visible.

---

* See p. 33. Die Mechanik der Gelierknochelchen und des Trommelfells. Bonn, 1869.

† Helmholz loc. cit.

PERFORATIONS OF THE MEMBRANE OF SHRAPNELL IN PURULENT INFLAMMATION OF THE MIDDLE EAR.

BY CLARENCE J. BLAKE, M D., BOSTON.

AMONG the complications of purulent inflammation of the middle ear, the perforation of the membrane of Shrapnell is of comparatively rare occurrence. This may be explained rather by the position and anatomical relations of this portion of the dividing wall between the middle and outer ear than by any power of resistance afforded by the structure of the membrane itself, containing as it does none of the fibrous structure of the membrana tympani. The laxity of the membrane of Shrapnell — a characteristic marking the appropriateness of the name membrana flaccida given it by Helmholz — is a still further protection from such accidents as would be liable to cause perforation.

The position of the membrana flaccida at the upper portion of the tympanic cavity, and its protection from the action of force exerted from within outward by the neck of the malleus and the ligamentum externum mallei, render it necessary to seek some further explanation of the occurrence of a perforation than that usually required in considering the ætiology of perforations of the membrana tympani as a sequence of purulent inflammation of the middle ear. This explanation, it would appear from the cases which have come under my observation, may be found in the occurrence of especially localized disease of contiguous parts; and a study of the cases of perforation of the membrane of Shrapnell would therefore resolve itself in a measure into a study of the cases of purulent inflammation of the middle ear, in which ulceration and granulations or polypoid growths occurred in the upper and outer portion of the tympanic cavity. Cases of purulent inflammation of the middle ear, accompanied by destruction of the membrana tympani, in which the most profuse discharge has its origin in the

upper portion of the tympanum, and where this part of the cavity is the seat of numerous small polypi, are by no means rare. The destruction of the membrana tympani, however, affords a free opening for the outflow of the purulent secretion; and so far as the effect of pressure therefrom is concerned, the region of the membrane of Shrapnell is left intact. The case is quite otherwise, however, when the membrana tympani, thickened by previous disease, offers a stubborn resistance to the effects of the inflammatory and suppurative process within, or where the perforation which finally occurs is too small to afford an adequate opening for the escape of the discharge. In the former case, the perforation of the membrane of Shrapnell may be the primary perforation, and occur at an early stage of the disease; in the latter case, it is the result of secondary changes in the vicinity, and occurs at a later period. As an illustration of the former class, the following case may be cited, that of a young lady twenty-six years of age: As a child, she had been subject to occasional pain in the right ear, usually following a cold in the head. The attacks of ear-ache lasted, as a rule, not more than twenty-four hours, and were followed by slight diminution of hearing. At the age of sixteen, following such an attack, which was accompanied by a sense of fulness, a slight watery discharge was noticed. The discharge continued abundantly for several days, gradually diminishing in quantity and becoming thicker, more purulent, and finally offensive.

This condition had continued without material change for eight years, when an examination showed the following condition: the right meatus normal, the membrana tympani concave, of a dull gray color tinged with light yellow corresponding to the color of the discharge, which oozed in considerable quantity from a perforation situated above the short process of the malleus and including the whole of the membrane of Shrapnell. The whole surface of the membrana tympani was clearly visible, and neither an existing perforation nor any sign of cicatrix could be perceived. On washing

away the discharge by means of a small syringe with a fine beak of wire tubing, made for the purpose, small polypoid growths were seen protruding in part through the perforation and filling that portion of the cavity about the neck of the malleus. These growths were subsequently removed by the use of caustics, and the better opportunity for examination thereby afforded showed the perforation to be strictly limited by the outlines of the incisura Rivini and the fibrous bands passing anteriorly and posteriorly from the processus brevis.

The condition of the membrana tympani, thickened by previous disease, and the absence of perforation, together with the history of the first appearance of discharge, would lead to the inference that the perforation of the pars flaccida in this case was due to direct pressure of the accumulated secretion, the more so that the duration of the attack which preceded the discharge had been too short to permit the establishment of an ulcerative process, which would, in itself, lead to perforation of the membrane. The ulcerative process occurred later, as shown by the change in the character of the discharge, and the polypoid growths presented the final complication.

A second case, that of a man thirty-six years of age, is an illustration of the second of the two classes mentioned above, that in which the perforation occurred as the result of disease of long standing. For two years previous to his examination he had suffered from discharge from the left ear in a greater or less degree, the initial cause having been an acute inflammation of the middle ear, following a severe cold, and the discharge persisting, though varying in quantity and in degree of offensiveness during the two years. On examination the inner end of the left auditory canal was found to be filled with a soft polypus, the removal of which revealed a perforation in the inferior segment of the membrana tympani, through which there flowed an offensive purulent discharge in considerable quantity.

Above the short process of the malleus and at about the

centre of the membrane of Shrapnell, was a small circular perforation, such as might have been made with the point of a pin; through this small opening could be seen a dirty, yellowish point, and the same coloring showed through the remaining portion of the membrane. A probe passed through the perforation brought away a small portion of offensive caseous matter. The subsequent treatment was directed to the removal of the remains of the polypus and to cleansing the cavity. The patient passed from observation for a time and returned with the opening in the lower portion of the membrana tympani almost healed and affording but a small opening for the escape of the still continuing discharge, which now found its way into the meatus through a perforation of the pars flaccida, including nearly the whole of that membrane. Syringing, and the use of a cotton-tipped probe, revealed a caseous mass with underlying granulations closely packed about the neck of the malleus.

Since his last visit, the patient had suffered from a severe cold in the head and pain in the right ear, which was followed by a thin, watery discharge on forcibly blowing the nose; this discharge had persisted and was somewhat purulent and offensive. Examination of the right ear showed a linear cicatrix in the posterior portion of the membrana tympani with a minute opening at its lower end, through which a small quantity of discharge escaped. There was also an opening similar to the one first observed in the left ear, in the membrane of Shrapnell.

Subsequently, the opening in the membrana tympani diminished in size and the superior opening proportionately increased. In this case, the perforation of the membrane of Shrapnell would seem to have resulted from two causes. In both ears it occurred after the disease of the middle ear had become well established as a chronic purulent otitis media and its occurrence continuance and extension corresponded inversely to the course of the perforation of the membrana tympani. The long continuance of the purulent inflammation of the middle ear gave opportunity for the establishment of an ul-

cerative process in various portions of the tympanic cavity, and the gradual closure of the lower outlet for the escape of the products of ulceration gave an additional impulse to the direction of the disease, which resulted in the perforation of the structure least able to resist.

The presence of granulations in any of these cases is an unwelcome complication, whether they have occurred subsequently to the perforation, or whether they have been one of the indirect exciting causes.

The portion of the tympanic cavity from which they spring is of a character, both as to its contour and the character of the lining membrane, to afford excellent ground for the rapid growth of granulations, and for the accumulation of purulent secretion. The opening through which they may be reached is of necessity a small one, and this, in addition to the redundancy of the growths and their tendency to speedy recurrence, renders their extirpation very difficult. They may be confined to the tympanic cavity, or may push their way through the perforation in Shrapnell's membrane, and, freed from confinement, expand to a sufficient size to nearly or quite fill the inner end of the meatus, and mask the original lesion.

In both classes of cases, certain structural changes may result. The polypoid granulations, confined to the upper part of the tympanic cavity, may, by their vigorous growth, gradually displace the ossicula and change the contour of the membrana tympani, with, it is needless to say, serious impairment of hearing as a result. In one case, that of a man twenty-eight years of age, who had a purulent discharge from the left ear, which had existed from his childhood, as the result of scarlatina, the membrane of Shrapnell was found to have been entirely destroyed, leaving a comparatively large opening, through which the tympanic cavity could be explored, showing its upper portion to be quite filled with firm polypoid growths. The membrana tympani was, as a whole, very concave, the lower portion somewhat relaxed, and the malleus forced inward and downward; and a bent probe, passed

between the head of the malleus and outer tympanic wall, detected a firm mass of granulations. In two other cases, which illustrate the second class, a polypus projected through the perforation in the membrane of Shrapnell.

The first case was that of a man forty-five years of age, subject to purulent otorrhœa from boyhood; the tumor covered only the superior anterior portion of the membrana tympani; its removal with the wire snare revealed a small opening in Shrapnell's membrane, from which oozed a few drops of blood, and examination of the polypus showed it to consist of a rounded body, and a long, slender pedicle corresponding in size to the opening.

The second case was that of a woman thirty-one years of age, who had acute inflammation of the left middle ear three years previous to the time of her first visit; the pain accompanying the attack subsided with the appearance of a thin, watery discharge, which steadily became purulent, and as such had continued, steadily increasing in quantity. Within two or three months the hearing, somewhat diminished, had still further decreased, and at certain times, without known cause, was especially poor. Within a fortnight the hearing had diminished still further, and was not improved as it formerly had been by syringing and cleansing the ear. There was in addition tinnitus aurium and a sense of fulness in the ear and head.

Examination revealed a large mucous polypus, filling the inner third of the auditory canal. A probe could easily be passed below and behind it, and its point of origin determined at the upper portion of the membrana tympani. On elevating the tumor with the probe and uncovering the membrana tympani, the hearing was immediately increased.

The tumor was removed in two parts by means of the wire snare, and only the slender pedicle left. This was found to project through a small opening in the membrane of Shrapnell, which it entirely filled. This remaining portion was finally removed by means of the forceps and the application of caustic, and the neck of the malleus determined as the

point of origin of the growth. In both of the above cases the discharge ceased within a few days, and the opening in the membrane healed readily.

In the majority of cases of perforation of the membrane of Shrapnell accompanying purulent inflammation of the middle ear, of which the above cases have been cited in illustration, the principal consideration, as regards treatment, is that called for by the presence of granulations within the opening. The removal of these is primarily necessary to a successful termination of the case, and when they are at all luxuriant they are liable to render the treatment both tedious and vexatious. Not uncommonly they will appear to have been almost entirely removed, when within a few hours almost, a fresh growth will have started from some remote point and forced itself into view.

It is necessary, therefore, to frequently repeat the use of such applications as may seem best suited to the purpose, and to make the application as thorough as possible. The use of lunar caustic, which answers in some cases, would seem generally objectionable, whether in the form of the stick, in powder, or as a saturated solution, on account of the resulting eschar, and the impediment which it offers to further examination, and consequent more thorough application. Sulphate of zinc and sulphate of copper do not present the same objections. Caustic potash may be employed with great advantage, but the rules with regard to care in its use are especially applicable where it is used through a small opening, and among structures so important and so delicate as those lying within the membrane of Shrapnell. For the purpose of a free application, the use of alum, either in powder or in the form of small pellets,[1] would seem to best answer the required purpose, and in the majority of the cases in which it has been employed, its use has been attended with favorable results.

---

[1] As advised by Dr. C. E. Rider.

CHRONIC DISCHARGE FROM THE TYMPANUM, WITH PERFORATION OF THE MEMBRANA FLACCIDA POSTERIORLY.

BY C. H. BURNETT, M D., PHILADELPHIA.

JOHN M., 17 years old, came under my care in the Presbyterian Hospital of Philadelphia, in July, 1872. He states that his first ear trouble occurred when he was four years old. He is a pale, intelligent lad, a hard student in a classical school. His father died insane and he has a brother who is hopelessly insane. When the patient was twelve years old he began to have "gatherings in his ear" about twice each winter. A year before he became my patient, a constant and most copious discharge, preceded by pain, became established in the right ear. When I made my first examination of his ear, in July, 1872, I found the membrana tympani saturated with a yellowish-green pus. After removal of the pus I found no perforation save one in the membrana flaccida, above and behind the short process of the malleus; but at no time was there any perforation-whistle obtained by any mode of inflation of the tympanic cavity.

The hearing was reduced to $\frac{6 \text{ in.}}{50 \text{ ft.}}$ for the watch, and for the voice, nil.

I passed a probe a short distance into the perforation. The cavity was sensitive, but I found no denuded bone. The treatment consisted of instillations of a solution of nitrate of silver (80 gr.— f℥ij) once a week, at the hospital, and the patient was ordered to syringe his ear 3 times daily at home, and to instil a solution of zinc. gr. x — f℥i. The latter solution was sometimes substituted by solutions of alum, and later a solution of nitrate of lead. In four months the discharge ceased, the nitrate of lead, in my opinion, having had the best effect on the aural disease in this case.

In November the membrana tympani had assumed an almost normal appearance, save the cicatrix in the membrana flaccida.

At no time were there any granulations, and the discharge remained, uniformly, of a light color, and of the consistence of cream.

The hearing improved to $\frac{50 \text{ in.}}{50 \text{ ft.}}$ for the watch, and the voice could be heard close to the affected ear. The Eustachian tube was pervious.

On the first of January, 1873, the patient came to my office, complaining of pain and soreness in the mastoid process of the affected ear. He had no fever, tongue moist. I ordered perfect physical rest, with attention to general health, and by the 10th of the month all mastoid symptoms had vanished. There was no renewal of the discharge as the pain subsided. As the patient was studying too much at his school, his health began to fail. I therefore ordered him to quit school and take as much exercise in the open air as possible.

By the 1st of December, 1873, the discharge returned, with pain in the ear and soreness when the auricle was pulled gently. The discharge continued for three months and a half, with persistence of the old perforation in the membrana flaccida. I could readily see the discharge oozing slowly from the perforation, after drying the orifice with the cotton-holder.

At this second attack of discharge from the ear, I increased the strength of the solution of nitrate of silver, to 480 gr. to f℥i. This caused intense pain for a few minutes; then the pain ceased entirely. In conjunction with applications of the strong solution of silver, I ordered the use of a strong solution of the sulphate of zinc (30 gr. to f℥i) at home, which seemed to exert a good effect in the course of one month.

The most careful syringing became necessary while using this strong solution of sulphate of zinc, in order to remove the coagula or curds produced by it.

A few painful furuculi followed the cessation of the discharge.

On the 22d March of this year I measured the hearing distance, and found that the voice and the watch were heard five paces. There was a depressed cicatrix in the membrana flaccida, above and behind the short process. The membrana tympani, below the folds, was almost normal in color.

Dr. J. Orne Green ("Boston Med. and Surg. Jour.," March 26, 1874) has called attention to this variety of purulent inflammation of the tympanum, in a paper read before the Boston Society for Medical Improvement, Dec. 22, 1873. He says, "While in the common purulent inflammation of the tympanum, the pus secreted by the mucous membrane which lines that cavity finds an exit by rupturing the drum-membrane, either in the anterior or posterior segment, somewhere about its centres I have seen a few cases where the rupture has occurred in the extreme upper portion of the membrane, the membrana flaccida, and these have been so obstinate under treatment, and so serious, that I desire to direct special attention to them."

Dr. Green then alludes to five cases occurring in his practice, two of which he describes minutely. There are many points of resemblance between Dr. Green's cases and my case, viz. "the intensity of inflammation confined to the upper portion of the tympanic cavity; that is, the lower portion of the tympanum was never filled with pus, nor was any congestion seen, except in the neighborhood of the perforation"; it was also a noticeable fact that no perforation-whistle followed the perfect inflation of the tympanum in our cases.

The following features, however, seem to characterize my case almost antithetically when compared with Dr. Green's cases. My case came on with attacks of great pain, while the patient was a child; there was no denuded bone; the perforation in the membrane was just large enough to admit the small, round head of my silver probe, and there were from time to time attacks of pain and throbbing in the affected ear, and finally the discharge ceased under the use of astringents, in stronger solutions after the relapse than at

first. My patient had marked hardness of hearing, but no tinnitus at any time.

It is of interest to note that the first cure of my patient was effected in the autumn of 1872, with no relapse until the winter of 1873–74. In the winter of 1872–73, there were simply ten days of mastoid soreness and pain, with no discharge.

The patient has resumed his studies at school, and has gained in stature, strength, and hearing.

Throughout the history of my case there is a tendency to recur; but during the two years he has been my patient, he has had only eight months of aural discharge, viz. the first four months of my treatment of him, followed by one year of freedom from aural discharge, and then a recurrence of otorrhœa for three and a half months, which brings us to March of this year, since which date there has been no aural discharge.

IRRITATION OF CHORDA TYMPANI; PARALYSIS OF FACIAL; POLYPOID GROWTH UPON THE MEMBRANA TYMPANI; PERIOSTITIS OF THE MALLEUS AND ADJACENT BONY TEXTURES.

BY HENRY D. NOYES, M. D., NEW YORK.

Dr. W. E., aged 33, Denver City, Colorado, gives the following history, in his own words: —

"A distressing tinnitus aurium has troubled me as far back as I can remember.

"When quite a young child I used to lie awake at night and complain that the ugly noises would not let me go to sleep. At that time I had no suspicion that the sounds were not real, and it was only by the observation of later boyhood that I came to realize that they had their origin in a disordered condition of the ear itself, and that only the left ear was affected.

"Through my reiterated complaints of noises which had no existence, and my constant assertion that I could not keep

them out by stopping my ears, those having charge of me recalled to mind, as a circumstance too trivial to be particularly noted at the time, that when I was about one year and a half old I had an abscess in my left ear, which seemed to cause me a great deal of pain, until it broke and discharged its contents. After this it was supposed to have healed up entirely. Of the exact nature and locality of this abscess I have no knowledge. The tinnitus was never absent, was different at different times, and at one time or another it embraced almost every sound within the range of my actual experience, and without exception it was made up of sounds with whose real counterparts I was perfectly familiar. It was always aggravated by violent exercise.

"A noise like the rumbling of a distant waterfall was the most constant and the most distressing. Among other noises the croaking of frogs, the ringing of bells, and the singing of katydids were the most conspicuous.

"The hearing of the offending ear was seriously impaired, and there was unmistakable evidence of perforation of the membrana tympani. By closing the external meatus with the thumb and exerting sudden pressure, a current of air could at any time be driven through the Eustachian tube. This current of air imparted a distinctly bitter taste to the root of the tongue. The secretion from the walls of the meatus was diminished in quantity, and was somewhat harder and a good deal darker than normal cerumen, and had a slightly fetid odor.

"This condition of the ear was maintained without material change until my twenty-third year. About this time, without any exciting cause of which I am aware, a thin yellow discharge from the meatus began to manifest itself It was only slightly offensive and not very profuse in quantity, but was very persistent. Syringing the ear with warm water or astringent solutions seemed not to affect it in the least. Several times since then the discharge has spontaneously ceased, sometimes for months at a time; but sooner or later

it has always returned. Its cessation was never followed by any inconvenience. Soon after it was first established, there supervened an occlusion of the opening which had heretofore existed in the membrana tympani, and I have never since been sensible of the passage of air through this membrane.

"A sensation very difficult to describe, now for the first time began to give me serious annoyance. It was a sensation of weight, of pressure, of obstruction, and of distension, and affected the entire left side of my head. It came at first in paroxysms of uncertain length, and at irregular periods, but soon became constant. I finally grew in some degree accustomed to it and was less disturbed by it than when I first felt it. Not long after this very unpleasant symptom was first observed, the chorda tympani nerve began to manifest symptoms of being in a state of irritation. I one day noticed that on pressing the tip of the finger rather forcibly into the opening of the auditory canal, the gustatory nerve of the left side of the tongue was quite sensibly affected. Soon afterward I noticed that a sharp pinch given to any part of the pinna, between the thumb and finger, induced the same result. Within two or three weeks after this peculiar irritation of the tongue first manifested itself, it could be excited at any moment by merely passing the tip of the finger over the left side of the face. It continued to be more and more easily induced, until finally, within two or three months after its first advent, it became constant, without any external exciting cause. Since then it has never been wholly absent, and the means which first called it forth, to wit, pinching the pinna, etc., at any time intensifies it.

"An increased flow of saliva into the left side of my mouth has always been in direct proportion to the amount of this peculiar irritation present. The larger portion of this saliva comes through Wharton's duct, but the left parotid gland also secretes more abundantly than the right.

"Paralysis of the facial nerves finally supervened quite sud-

denly about the first of last February, nearly ten years after the stoppage of the opening in the ear-drum. During all this period the tinnitus aurium had been in no degree arrested, having maintained throughout its original characteristics.

"For several months preceding the paralysis there was slight but very frequent twitchings of all the muscles supplied by the facial nerve. Rarely more than one muscle was affected at one time.

"It was during an attack of acute inflammation of the auditory canal that I laid down one morning to take a nap. I attributed this inflammatory attack to undue exposure. The walls of the meatus were hot, tender to the touch, and quite painful, but there was no deep-seated pain. When I awoke, after sleeping about two hours, the paralysis had taken place."

My inspection of the case showed complete paralysis of the left side of the face, including the forehead and orbicularis oculi; the mouth, which is large, drawn to the opposite side; the tongue, when protruded, came out perfectly straight, and could be moved at will to either side; the meatus auditorius large and straight; the drum-head nearly flat, tense, white, and thick, not vascular. Seated upon its upper and middle portion was a polypoid growth as large as a small pea. It was firm to the touch, and though red, not disposed to bleed. The slightest touch of it, though not painful, excited sensations in the tongue. A moderate quantity of pus was found in the canal, but the walls were not sensitive to touch. The Eustachian tube pervious; the cavitas tympani easily inflatable. Hearing distance for the watch requires contact.

To destroy the polypus the galvano-caustic was employed. Its use was severely painful, but not succeeded by great reaction. A rather copious discharge ensued, the sense of pressure in the head was much abated, and the tumor grew smaller. A succession of less severe cauterizations by nitric

acid were afterwards employed, and finally what remained of the growth was deeply incised by a needle and treated by nitric acid. After this it disappeared, and the drum-head exhibited no irregularity of surface. It seemed evident, then, that there was no similar granulation tissue in the middle ear. There was no perforation of the membrana tympani. The polypus sprang from the manubrium of the malleus, and a fair inference seems to be, that this bone had been the seat of chronic inflammation, involving its substance and periosteum, and which had caused the irritation of the chorda tympani. This must have existed since a very early period of the disease, and a more than ordinary amount of congestion must have existed in the bony tissues to have produced the cerebral symptoms, and finally the paralysis of the facial nerve. The employment of the galvano-caustic upon the polypus gave great relief to the heavy and oppressive sensations about the head, and the patient on returning home was quite free from this annoyance. The discharge from the ear disappeared. The hearing distance increased from watch contact to watch at six inches. The paralysis of the facial nerve exhibited no improvement. The irritability of the chorda tympani was not completely relieved, but greatly abated. In this connection, I introduce the notes furnished by Dr. J. J. Mason, who was kind enough to take charge of the electrical treatment of the case.

"No response obtained by strong faradic currents, and as there seems to be an idiosyncracy, consisting in excessive sensitiveness to the Voltaic current, no satisfactory test of its action can be obtained. Closing and opening five cells causes considerable vertigo, with no trace of contraction. Ten cells were tried, with no more effect on the muscles, but with great aggravation of vertigo. Very rapid interruption by clock-work was tried, with the effect of reducing vertigo, but of course diminishing the specific action of the current. The patient notices a sensation of taste referred to left chorda tympani, whenever he makes an effort to move the paralyzed side.

"The treatment has been continued (three times a week) up to date, and has consisted of mild faradic currents to the affected muscles. No improvement either in voluntary or electric 'contractility.'"

JOHN J. MASON.

NEW YORK, May 15, 1874.

The hyperæsthesia seems to be limited to the affected side, and only reveals itself to electric irritation.

Cases of persistent irritation of the chorda tympani are not often recorded, and the facts of this case possess both a clinical and physiological value. In the latter sense no new facts are shown, but the results of experiments upon animals are confirmed. It appears that the nerve has no control over muscles of the tongue, but simply excites sensations of pain and of taste, which are perceived chiefly at the side and upon the back of the tongue. It also in a marked degree provokes secretion from the sub-maxillary gland, and in a less amount from the parotid.

These are precisely the facts which have been elicited in experiments upon the lower animals.

NEURALGIA IN AND ABOUT THE EAR.

BY J. ORNE GREEN, M. D., BOSTON.

BY neuralgia in and about the ear, I refer to neuralgic pain either in some part of the ear itself, or else in some part so near to the ear that the pain is referred by the patient to that organ.

It has been my fortune to see a considerable number of such cases, in which the disease has had various causes, and in the medical journals I find a number of others recorded; but as the text-books on the ear touch only slightly and imperfectly upon the subject, I have endeavored in the following imperfect paper to record my experience, hoping to direct more particular attention to this class of cases.

That the ear and its neighborhood should be subject to neuralgia can excite no wonder when we consider its nervous relations; for it is no exaggeration to say that no other organ in the body is in direct connection with so many important nerves as the ear. The outer ear derives its nerves from the third cervical, the trigeminus, and the pneumogastric; the middle ear from the trigeminus, facial, glossopharyngeal, pneumogastric, and great sympathetic; while on the inner wall of that cavity we have the tympanic plexus, consisting of a branch from the great sympathetic, a branch from the superficial petrosal, which connects the otic ganglion with the facial nerve, and the tympanic branches of the glossopharyngeal. "By means of the otic ganglion, the soft palate, the membrana tympani, with its tensor muscle, the lining membrane of the tympanum, and the integument of the external ear, are put in sympathetic relation with each other, and with the nervous system generally." *

The diagnosis of neuralgia of the ear can only be made after a thorough examination of the ear itself has excluded all disease of that organ; for if any such disease exists it is most probably the cause of the pain. Inspection of the meatus and membrana tympani should show no signs of inflammation of any kind, or even of congestion; the Eustachian tube should be free from disease, the conducting apparatus normal; the hearing should be tested and found normal; all subjective noises and throbbing should be absent, for although we can imagine a continued neuralgia of the tympanic plexus finally affecting the nutrition of the middle ear and so causing subjective noises, we have no means of distinguishing such defective nutrition from the simple inflammation of the middle ear; lastly, hypertrophic inflammation of the middle ear should be carefully excluded by means of the history, the mobility of the conducting apparatus, and more especially by the tuning-fork on the head, for some patients with this disease are subject to a dull, con-

* Roosa's Tröltsch. p. 198.

tinuous pain in the ear or mastoid cells, which is much more likely due to the chronic inflammation going on in the mucous membrane of the tympanum than to a true neuralgia. Unless a careful examination has thus excluded all of these conditions, a diagnosis of neuralgia of the ear would be not only uncertain, but very improbable, for the disease is comparatively rare, while the various forms of inflammation are exceedingly common.

When Bonnafort asserts* that the auditory nerve, the chorda tympani, or the nerve supply of the tympanic cavity may all be the seat of otalgia, he probably uses otalgia to express simply a pain in the ear, but not necessarily a neuralgia, *i. e.* a pain in the nerve without an inflammation around it; for we certainly have no authority for assuming that neuralgia ever exists in a nerve of special sense like the auditory. He also gives no means of distinguishing a neuralgia of the chorda tympani, nor have I ever seen any such reported. The case reported by Roosa,* as otalgia from syphilitic exudation upon the seventh nerve, I should also reject as one of real neuralgia, from the fact that the tuning-fork on the head was heard loudest in the affected ear, and it seems most probable that a slight inflammation, perhaps of the hypertrophic variety, was just beginning in that tympanum.

The neuralgia in the cases which I have seen, has been of two kinds: stationary, the pain being always referred to one spot, or darting along the peripheral course of the nerve or one of its branches; the pain was more apt to be of a dull, continuous character, with exacerbations with or without cause, than of the lancinating character with complete remissions. In its causes it does not seem to differ from other neuralgias; in the reflex variety, an irritation, generally an ulceration, could be found in some of the neighboring tissues, while in the other variety, not reflex, the cause was not more evident than in most neuralgias; in some of the latter variety there was a decided rheumatic diathesis; in some, a

*Roosa, p. 512.

predisposition to neuralgia as shown by similar pains in other parts of the body; and in some a distinct exposure of the affected part to cold was assigned as the exciting cause. Malarial poisoning, as a cause of any of these neuralgias, I have never seen myself, although it is a well-recognized cause of neuralgia of other parts. Syphilis in one case seemed to be the exciting cause of a cervico-occipital neuralgia.

These neuralgias have been of two varieties, reflex and non-reflex or direct; in all of them the patients have considered the ear to be the seat of disease, and have referred the pain generally to that organ; but on close questioning have been able to locate the pain, either deep in the meatus, or at some point close in front of or behind the auricle. Of the reflex variety, we may have neuralgia of the tympanic plexus, or of the nerves of the Eustachian tube. Of the non-reflex variety, we may have neuralgia of the auriculo-temporal branch of the trigeminus, a zoster of the small branches of the trigeminus or facial which supply the tragus and walls of the meatus; a zoster of the small branches supplying the fossa of the helix, and also a cervico-occipital neuralgia, in which the pain is referred to the mastoid region.

In neuralgia of the tympanic plexus, the pain is referred directly to the ear, the patient speaking of it as deep within the meatus, and only there; in that of the Eustachian tube, the pain is referred to a spot just below the auricle, between the mastoid and the ramus of the lower jaw, but is deep seated, and the point to which it is referred is not sensitive on external pressure, so that the facial nerve, at its exit from the Fallopian canal (if a neuralgia of that nerve so high in its course, ever exists) is excluded. Of neuralgia of the Eustachian tube I have seen but one instance, to be mentioned later.

The neuralgia which I have referred to the auriculo-temporal branch of the trigemenus is characterized by pain about one fourth of an inch in front of the lower portion of the tragus, at the spot where this nerve emerges from behind the jaw and becomes subcutaneous, dividing into the nervi

auriculares anteriores and the nervi meatus auditorii externi. The pain is generally referred only to the point of exit of the nerve, but occasionally shoots upwards from this spot towards the temple; on pressure, this spot is found to be abnormally sensitive, and some cases show the well-known characteristic of neuralgia, that while slight pressure causes the pain, still greater pressure relieves it.

The neuralgia from herpes zoster, so far as I know, is only found in the nerves supplying the tragus and meatus, and those small filaments supplying the anterior surface of the helix; it is characterized by the neuralgic pain in the nerves, soon followed by the herpetic eruption.

In cervico-occipital neuralgia the pain is generally referred to the mastoid region or even still farther back towards the occiput, but occasionally is both in front of and behind the auricle. According to Valleix, there may be five points douloureux: an occipital point between the mastoid and the first cervical vertebra; a superficial cervical point between the trapezius and sterno-cleido-mastoid muscles; a mastoid point just behind the mastoid process corresponding with the position of the nervus occipitalis minor and auricularis major from the cervical plexus; a parietal point over the parietal eminence; and an auricular point on the posterior surface of the auricle. That the pain in cervico-occipital neuralgia occasionally surrounds the ear is readily explained from the fact that the auricularis major of the cervical plexus sends a branch to the auriculo-temporalis of the trigeminus. It may be thought that I am wrong in speaking of a distinct neuralgia of the auriculo-temporalis alone, and have confounded it with the cervico-occipital variety; but in the cases of neuralgia of the auriculo-temporalis, which I have seen, the pain has been confined to the course of that one nerve, and the only painful point was at the exit of that nerve; while in those of cervico-occipital neuralgia, although there might be pain in the region of the auriculo-temporalis, it was not confined to that region, but more or

less pain was also felt behind the ear, and one or more of Valleix's points douloureux could be discovered.

A reflex neuralgia of the tympanic plexus from carious teeth is mentioned by Schwartze and by v. Tröltsch and Roosa in their text-books on the ear, and I have seen a few cases. The pain is generally continuous, but subject to exacerbations, and occasionally is distinctly lancinating; it is referred directly to the deeper parts of the ear, but inspection and thorough examination of all parts of that organ reveal no disease of any kind there. The patients generally deny the existence of a pain in any other region, but on close questioning can often recall that in the beginning of the attack there was a slight pain or tenderness in one of the molar teeth, usually so slight that it has entirely escaped their memory. In some cases, however, slight darting pains from the ear to the tooth, or vice versa, have directed attention to the connection of the two organs. In most cases I think some slight connection between the ear and the tooth can be made out; but where such is not the case, and we have at the same time a neuralgia of the ear and a distinctly diseased tooth on the same side as the pain, the other causes and varieties of neuralgia with which we are acquainted being excluded, the tooth can fairly be considered the cause of the pain. Of course the diseased tooth requires attention, and in all the cases of this form which I have been able to follow, the appropriate treatment of the tooth, either by filling or extraction, has cured the neuralgia.*

---

* Since this paper has been in the hands of the printer I have seen a case which showed very plainly a reflex pain in the teeth from irritation of the pharynx. While examining a lady who has been for years a great sufferer from neuralgia of the cranial nerves, and who is now developing a hypertrophic inflammation of the middle ears, I had occasion to use the Eustachian catheter: just as the instrument touched the mucous membrane near the mouth of the Eustachian tube, she said that it gave her severe pain in the teeth of the upper jaw on that side. A repetition of the experiment several times was immediately followed by the same "toothache"; an instance of reflex neuralgia from the pharynx, probably through the palatine branches of the spheno-palatine ganglion to the superior maxillary nerve.

As branches of the trigeminus supply both the teeth and the middle ear, we have here a characteristic reflex neuralgia, viz. a source of irritation; the tooth, on one branch of a nerve with a neuralgia of the ultimate fibres of another branch of the same nerve, connected with the first through a ganglion, the Gasserian.

Another variety of reflex neuralgia of the tympanic plexus is seen as the result of disease of the larynx. Tröltsch says that Gerhardt has observed severe pain in the ear in ulcerative destruction of the epiglottis almost constantly; it may, he says, exist either permanently or only during the act of swallowing. Some years ago, in an interesting paper, never published, read before the Society for Medical Observation, Boston, Dr. S. W. Langmaid gave the histories of several cases of epithelioma of the larynx, in some of which an excruciating neuralgia of the ear was the prominent symptom, which continued till death, and could not be relieved. The ears themselves were not diseased, nor were there other symptoms than the pain in them. Within a year, I was asked to see a patient in the City Hospital who was suffering from well-marked laryngeal phthisis; in him, one of the most urgent symptoms was severe pain in the right ear, although careful examination of that organ failed to develop the slighest trace even of congestion of the middle ear, nor was there in his case any decided catarrhal inflammation of the Eustachian tube or posterior nares. The pain was here more or less constant, but occasionally sharply lancinating; it was, however, only present in the ear, and the patient was not conscious of any connection between the larynx and the ear. Although the laryngeal affection progressed, the neuralgia of the ear gradually diminished, less from treatment, I think, which was necessarily palliative, than of itself; the last few weeks of life he was almost entirely free from it.

The course of these reflex neuralgias from the larynx is less easily made out than some of the other varieties; but still we have the anatomical fact that the mucous membrane of the larynx is supplied by the laryngeal branches of the

pneumo-gastric, and that a small branch of the same nerve is given to the tympanum from the jugular foramen. Possibly the petrous ganglion furnishes the ganglionic connection between these two branches.

The only case in which I thought I had to deal with a neuralgia of the Eustachian tube was one in which the only disease discovered was very superficial catarrhal ulceration of the pharynx; the only symptoms in the ear were quite sharp, lancinating pains, which the patient described as situated directly beneath the auricle, and as darting from the throat towards but not into the ear, and on my inserting the catheter said that I touched the exact seat of the pain. The relief of the pharyngeal trouble removed the pain of the ear; and although it might be claimed that the pain was dependent on a slight catarrhal inflammation of the tube, still the pain was so marked, and the inflammation of the tube so slight, if any, that the case assumed a distinctly neuralgic character.

Of neuralgia of the auriculo-temporal branch of the trigeminus, I have seen a number of cases, mostly in nervous women subject to neuralgia of other nerves, but in at least one case attacking a strong, otherwise healthy, man. They all had a well-marked painful point just where this nerve becomes superficial in front of the tragus: to this spot the pain was referred. In some cases the pain was much increased by any movement of the jaw, but in most this symptom was not present. The only diseases with which this neuralgia seems likely to be confounded, after inflammations of the ear have been excluded by careful examination, is the tenderness of the tragus and cartilage of the auricle, which occasionally for some days precedes a diffuse inflammation of those parts, but in its earlier stages gives no objective appearances, and a herpes zoster of the minute branches of the auriculo-temporal which go to the meatus, and which will be spoken of later. By means of pressure with the tip of the finger, however, it will be found that the tenderness is wholly in front of the tragus, and that the cartilage is not sensitive. If the cartilage was sensitive, I should rather suspect an inflam-

mation of that tissue, or herpes zoster, than a true neuralgia.

In the treatment of auriculo-temporal neuralgia, I have found a small blister or a succession of blisters over the sensitive spot the most effectual single remedy, and this combined with a general tonic course has usually relieved the patient very soon. The effect of the blisters is often very marked: one case in an old lady, which had lasted continuously for four months, was entirely relieved by two small blisters at intervals of four days.

The only case of zoster of the tragus and meatus with which I am acquainted is that of Dr. Anstie, admirably described by him in the "Practitioner." The disease began with acute pain in front of the tragus, recurring regularly four times in the twenty-four hours, and darting up into the meatus, the maxillary articulation, and on to the side of the head; there was no tenderness on pressure or abnormal appearance in the ear; a point douloureux existed just in front of the tragus. On the ninth day the pain began to diminish, and on the thirteenth, herpetic vesicles appeared on the auricle, which from irritation became ulcerated and very susceptible to cold, which set up the old neuralgic pain; on the twentieth day all symptoms had disappeared.

For treatment Dr. Anstie recommends morphine hypodermically in the region of the auriculo-temporalis, one sixth of a grain twice a day, the painful parts to be hermetically sealed from the air, — the external ones by collodion, and those within the meatus by warm, simple ointment or tallow; the meatus also to be kept closed by cotton-wool. Counter irritation by mustard or cantharides over the occipital triangle he also thinks might prove beneficial by reflex stimulation.

The only disease with which this zoster seems likely to be confounded is the true neuralgia of the auriculo-temporalis just described. In all the cases of the latter affection which I have as yet seen, there have been no pains darting into the meatus, nor have they been distinctly remittent: in other respects the earlier symptoms of the two affections coincide;

but the duration of the pain would help us in a differential diagnosis, for in the zoster the characteristic eruption appears soon, — in Dr. Anstie's case, on the thirteenth day, — while in the true neuralgia the pain has often existed a long time when the case is first seen. That such a zoster as he has described is often the cause of ear-aches, which are mistaken for suppurative inflammation within the tympanum, as suggested by Dr. Anstie, is a mistake that could be made by no one capable of examining the ear; the absence of tenderness in and around the ear, and of all abnormal appearances in the meatus and membrana tympani, the want of subjective noises, throbbing, or any degree of deafness would sufficiently distinguish it from inflammatory affections of the tympanum.

A zoster of the small nerves supplying the helix I have seen once in a patient shown me by Dr. H. F. Damon. There was a well-defined herpetic eruption over the anterior surface of the helix, which had been preceded for some days by considerable remittent pain in that part, which disappeared on the appearance of the eruption; in a few days the vesicles dried up and the disease had subsided. The characteristic eruption sufficiently distinguished it from any other affection, and if the patient had been seen in the early stage of pain, before the eruption had appeared, I do not know of any disease with which it could have been confounded.

In two or three cases I have been consulted in regard to a cervico-occipital neuralgia, which had been supposed to be an inflammation of the ear. I can add nothing to Valleix's and Niemeyer's description of the disease, except that in the cases which I have seen, and which had been mistaken for inflammation of the ear, the pain was specially marked in the mastoid region. The pain was generally somewhat remittent, and one or more of Valleix's points douloureux could be made out, usually the mastoid or parietal points. The only disease with which it seems likely to be confounded is the hypertrophic inflammation of the mucous membrane of the middle ear, in which we sometimes have a decided al-

though slight pain in the mastoid process without tenderness. The absence of any degree of deafness or noises in the ear, or of any change in the bone-conduction, as shown by the tuning-fork on the head, together with the presence of one or more of the painful points, would serve sufficiently to distinguish the disease. The disease is stated by Niemeyer to be much less obstinate and of shorter duration than neuralgia of the trigeminus. For treatment in recent cases Valleix recommends blisters externally and the usual remedies for neuralgia internally. In one case of the disease now under observation at the City Hospital, and dependent on syphilis, croton chloral has had a very decided effect in controlling the pain from the very first dose.

What the disease is which is characterized by severe and often remittent pain deep in the ear, coming on from exposure of the part to cold, but without any abnormal appearances being visible, I do not feel certain; but it seems most probably a neuralgia, either of the tympanic plexus or of the nerves of the membrana tympani. Gruber's* case of typical otalgia is the best example of this affection with which I am acquainted, and this was relieved, after quinine had failed, by twenty grains of Iodide of Potassa each morning; after the third dose there was no return of the pain. I have, myself, seen one case, much less severe than Gruber's, characterized by remittent pain deep in the ear, without any change visible, or any of the other above-mentioned varieties of neuralgia to be made out. In this case the pain was readily relieved by Quinine in moderate doses.

From these observations I should distinguish the neuralgias, in and about the ear, as follows: —

Neuralgia of the tympanic plexus,
- direct, from exposure to cold;
- reflex, from carious teeth;
- reflex, from ulcerative disease of the larynx.

---

* Monatschrift für Ohrenheilkunde, III, 9.

Neuralgia of the Eustachian tube;
direct, from ulceration of the pharynx,
Neuralgia of the auriculo-temporalis.
Zoster of the tragus and meatus.
Zoster of the helix.
Cervico-occipital neuralgia.

Further observations will, undoubtedly, add others to the list, particularly of the reflex varieties.

A CASE OF CHRONIC SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR TERMINATING FATALLY FROM EXTENSION OF THE INFLAMMATION TO THE INTERNAL EAR AND THE BRAIN, OCCURRING IN THE PRACTICE OF DR. AGNEW.

REPORTED BY DAVID WEBSTER, M. D., NEW YORK.

April 23, 1873, G. R. L., 27, clerk, was placed under my care by Dr. Agnew. There had been a continuous discharge from his right ear for seven or eight years. For the last year or two he had been troubled with occasional attacks of vertigo and of headache. He had been treated by Dr. Agnew at irregular intervals for several months without improvement. Tinnitus was not a prominent symptom, but he had some occasionally in both ears. The tuning-fork when placed on the teeth was heard the best in the diseased ear. His pharynx was granular There was pus in his right auditory canal and a perforation of the membrana tympani at its supero-posterior portion with a granulation sprouting through.

Both ears could be readily inflated by the Valsalvian method.

His ear was cleansed by syringing with warm water and a forty-grain solution of nitrate of silver was applied to the granulation. The same was applied to his pharyngeal granulations.

24th. Very little secretion. Complained that syringing made him dizzy, so cleansed with a cotton swab and made the application as before.

25th. Dizziness increased. Inflated by Politzer's method and ordered ℞ Podophyllin gr II, Ext. Aloei gr VI M. Divid in pil. No. II. S. one night and morning.

26th. Dizziness incapacitated him for business to-day. On rising suddenly he feels inclined to stagger to the left, and has to "stop to get his bearings." Applied a leech half an inch in on front wall of meatus.

27th. Dizziness the same; has also a feeling of drowsiness, and the ear feels as though it were stuffed with cotton. Inflated by Politzer's method, applied the nitrate of silver to the granulation, and a blister behind the ear, and ordered Potas. Bromid. gr. XX three times a day.

28th. Dizziness somewhat better; applied another leech.

May 6th. P. A. H. $= \frac{\text{Contact}}{60.}$. The granulation has rapidly increased in size; removed the part external to the membrane with the snare and touched the base with nitric acid. Has throbbing in head; bowels constipated. Ordered powders of Rhubarb, Soda, and Ipecac.

18th. Yesterday removed pieces of the granulation with forceps. His head feels "thick" to day, no pain or dizziness. Applied lig. ferri persulph.

22d. Has throbbing headache again; bowels regular. Ordered Potas. Bromid gr. XXX *ter in die.*

23d. Head much better. P. A. H. $= \frac{1/2}{60}$.

July 7th. The granulation has been touched several times with nitric acid and several times with a saturated solution of nitrate of silver with no benefit. Four days ago he went into the country, and, while spending the evening with a friend, sat down on the damp grass for about an hour, and to-night he comes with an otitis externa.

13th. After five leechings the swelling in external auditory canal has mostly disappeared. P. A. H. $= \frac{1}{60}$.

Sept. 26th. Has been under treatment constantly, seen several times a week and the usual means resorted to. Five

days ago he used Clarke's aural douche so hot that he could not bear it. The next day his ear felt badly, and when I saw him a day later, although the external ear and membrana tympani appeared as usual, he complained of dizziness. I applied a leech and instructed him to bring three leeches with him the next day if the dizziness was not relieved. The following day I received a telegram, requesting me to call in the evening and see him. I found him in bed, where he had been since the previous night, which he had passed in sleeplessness. Pulse 78; skin hot; bowels regular; a constant and distressing throbbing in the depths of the ear, and unable to stand alone for dizziness. Applied three leeches, two behind the auricle and one in front wall of meatus. Ord. Potas. Bromid. ℥ss 4 times a day, and a teacup full of beef-tea every three hours, and a bag of ice to the head. This morning the throbbing had ceased; pulse 73; patient otherwise the same. The head was raised by means of pillows. Dr. Agnew saw him this P. M., and judged that he had progressive inflammation of the petrous portion of the temporal bone.

27th. Bowels not moved yesterday. Ord. pills of Aloes, Podophyllin and Nux Vomica; 4 leeches at back of ear at 5 P. M.; blister to nape of neck; hot mustard foot-bath in evening.

28th. Skin not so hot; pulse 70; no thirst since attack; dizziness is no better. Ord. large mustard plaster to nape of neck.

29th. Very restless last night; skin hot; pulse 74; has been slightly delirious. Had severe pain in front of ear last night. Much nervous twitching in his sleep. Starts, and awakens suddenly.

Dr. Roosa saw him in consultation with myself and Dr. Agnew to-day, and agreed that the prognosis was most unfavorable, and that the inflammation had extended from the labyrinth. Dr. Roosa advised Potas. Iodid. with the Bromid, to keep up his nutrition, and to examine his urine.

30th. Pulse 74; skin hot and cool alternately; severe pain in front of ear, extending to top of head. No albumen in urine.

Oct. 1st. Rested better last night; pulse 75; skin cool; less pain in head; complains of pain in right eye, but pupil is lively and vision unimpaired.

Oct. 4. Patient has shown gradually increasing loss of memory for last few days and has wandered a good deal in his sleep, but has always become conscious when spoken to. This morning he showed an indisposition to talk; face somewhat flushed; pulse 80; paresis of internal rectus of right eye. Began to have diplopia yesterday.

5th. Has what he calls rheumatic pains in his knees, relieved by rubbing.

6th. Weaker; more delirious; pulse 90, and not so strong. ℞ Quin. Sulph. gr. ½, and Tinct. Ferri Chlor. ♏. v. *ter in die.* Ord. to sponge all over with whiskey and water daily.

Dr. Agnew thinks he has now a general hyperæmia of the arachnoid, with a tendency to œdema, arising from inflammation of the petrous bone.

7th. Awoke out of a sound sleep when I went in and was evidently delirious, making use of such expressions as "You can't come it over me! I am not to be humbugged any longer!" and then, recognizing me, reproached himself for having spoken so.

8th. Called this morning and found him asleep. Nurse informed me that, in consequence of our unfavorable prognosis, his cousin had placed him under the care of another physician. The following letter, from Dr. Wynkoop, completes the history: —

"New York, Dec. 19, 1873.

My Dear Doctor, — Mr. L——, in whose case you were interested, died day before yesterday. Much to my regret his family, at the last moment, decided not to have an autopsy. After I saw you his symptoms, which then were increasing, after a period of comparative freedom, grew

steadily worse, until, completely worn out, he died. Pain was the one symptom which overshadowed all the others. Until a fortnight before his death, this was confined to his head. It afterwards was referred to his legs, and, finally, to his heart and lungs. For the last four or five days respiration was slow — not more than eight or ten in the minute, and very irregular. There was evidently an increasing pressure on the medulla oblongata. Up to the very end there was no complete paralysis. During the last month the temperature never rose above 99½°, and for the greater part of the time it was normal. The pulse gradually crept up to 150, and irregular. The discharge from the ear continued freely to the end.

Very truly yours,

G. H. Wynkoop."

This patient kept his bed from Sept. 23d to Dec. 17th, a period of eighty-five days. It is to be regretted that no *post mortem* was made, but I thought a history of the case might be a useful addition to the literature of the subject.

I saw, one night last winter, a child five years of age, with meningitis from chronic suppuration of the middle ear. The ear, which had discharged since a year old, had never been treated. When I called to see the child on the following morning, it was dead.

The importance of treatment of these cases of suppurative inflammation of the middle ear in their *earliest stages* cannot be overestimated.

TENOTOMY OF THE TENSOR TYMPANI MUSCLE, DONE POSTERIORLY TO THE MALLEUS HANDLE BY GRUBER'S INSTRUMENT; WITH CASES.

BY OREN D. POMEROY, M. D., NEW YORK.

GRUBER, as well as Weber, has suggested that division of the tensor tympani might be done posteriorly to the malleus handle, instead of anteriorly.

In the transactions of this Society for 1873, Dr. J. Orne Green details several cases done according to this suggestion, with the recommendation of a modified Gruber's tenotome. The arguments in favor of the posterior method, as stated by Dr. Green, are mainly: 1. The frequent difficulty of reaching the tendon from the front of the malleus, on account of the narrow canal; 2. The tendency of the tensor to approach its insertion upon the malleus so as to form an acute angle with the posterior wall of the meatus; 3. The normally oblique position of the membrana to the axis of the meatus, taken together with the convex shape of its anterior wall, and 4. The difficulty of reaching the tendon in front when the manubrium is drawn far backwards, from an unusual position of the emergence of the tendon from its canal.

These general statements have been verified by the cases under consideration. In several of the tenotomies it appears plainly enough that they could not have been done at all, had the old method been attempted, as the membrane was actually invisible in front of the processus brevis, owing to the very narrow meatus.

In other cases, the great retraction of the malleus handle, backwards and upwards, made it wellnigh impossible to reach the very obliquely placed tendon, by the anterior method. In two or more cases it was impossible to determine whether or not the tendon was divided, as the membrane was so sunken as to leave little or no space for the passage of an instrument behind it. However, in these last

cases, the Gruber instrument, by its great thinness and delicacy of construction, is more available that the Weber tenotome, which manifestly requires more depth of tympanum for its operation.

Dr. Green's modification of Gruber's tenotome was used in a few instances. The conclusion arrived at was that, owing to its greater breadth near the extremity, the cutting edge was much improved thereby; that the shank being round instead of square, admitted of setting the instrument so that its cutting edges should present in any desired direction; that its superior delicacy of construction offered real advantages in the performance of this difficult operation; that its rounded end, making it necessary to puncture the membrane with a needle as a preliminary step in the operation, was an objection which might be obviated by making it sufficiently pointed to puncture the membrane readily. By the use of a little extra force, however, Dr. Green's instrument can be made to penetrate the membrana without the preliminary incision.

After the tenotomy, as the following cases may occasionally show, a bent probe was passed along the site of the cut tendon, and the membrane was moved outwards by catching the probe against the malleus handle, furnishing thereby another evidence that the tendon was divided. In a few of these cases it was not certain that the tendon had been divided, which may account perhaps partially for the poor results of treatment.

It is worthy of remark, that in every instance where the operation was attempted, it is here recorded, which must needs include numbers of cases in the nature of things not very encouraging to treatment.

By a perusal of the cases, it will be seen that the malleus handle was not placed too horizontally in more than two or three instances, the usual position being one drawn directly inwards, that is, foreshortened. A larger number of cases might furnish more material for establishing the truth of Gruber's statement regarding the variable position of the

emergence of the tendon from its bony canal on the inner wall of the tympanum. By comparing these results with those of paracentesis, we do not observe a striking difference. Perhaps the results here may be more permanent. In Case III, where the tinnitus was very troublesome and had existed for ten years, it was completely relieved, and up to Oct. 1874, has remained so.

A result of this kind has not been obtained by puncture, in my experience. The hearing has not, as a rule, been much improved. Probably this result will never be obtained by tenotomy, whatever mode of operation may be selected.

The disease in each instance was the ordinary chronic inflammation of the tympanum, and the cases are recorded as follows: —

Case I.

Rosetta C., aged eighteen. Duration of the disease four years. Tinnitus for two years, and now constant; formerly only at night. Hearing distance, right, watch pressed hard; snapping of finger-nails two inches. Appearance of membrana: processus brevis too prominent, manubrium retracted and too horizontal; posterior fold not exaggerated. Under Valsalva's inflation membrana does not move; with Siègle's otoscope manubrium immovable, but posterior portion of membrane freely moves.

Tenotomy done posteriorly to processus brevis. A probe, somewhat bent, was passed behind the manubrium and caused free movement of the membrane outwards. Meatus very narrow, and operation difficult. Done under ether. Some pain followed but not enough to prevent sleep. There was considerable swelling of the membrane and meatus. Hearing not improved. Tinnitus diminished about one half.

Case II.

Susan R , aged twenty-one. Duration of disease four years. Tinnitus in both; worse in right; constant in both. Hearing of right, voice, fifteen inches, left twenty inches.

Manubrium drawn inward; inclination normal; immovable by inflation or by traction with the pneumatic speculum, but by the latter the posterior-superior portion of the membrane moves freely. Tenotomy done under ether. Meatus narrow and the operation difficult. Some pain followed, but required no special treatment.

After the operation the manubrium moved outwards very freely under inflation. The hearing was diminished for ten days, but after that time was the same as before. The tinnitus was a little worse after the operation.

Case III.

Annie C., aged twenty; duration of the disease, ten years. Tinnitus constant in right; formerly the same in the left, but at present not at all in left. Hears a watch pressed in both. Manubrium in right not retracted noticeably, although there were other signs of sunken membrane. Tenotomy done posteriorly, and by passage of a bent probe to inner side of manubrium it could be moved outwards freely. Done under ether. Result of operation: hearing doubled; tinnitus disappeared wholly, and has not at all returned; there was some pain after the operation, and a little discharge for a few days.

Case IV.

John D., aged fifty-six; duration of the disease, many years. Hearing distance voice four inches in right. Tinnitus constant and very troublesome. Manubrium retracted, inclination normal, posterior fold exaggerated. Membrana not mobile by Siègle, except at posterior portion; no greater mobility of manubrium after operation. The hearing is improved as a result of the operation, and the tinnitus much diminished. Incision remained open four days, and there was a little suppuration, and a sufficient amount of pain to cause the application of a leech.

Case V.

Samuel P., aged thirty-four; duration of the disease, twelve years. Commenced in right. Tinnitus in right, until four years since, — then ceased. Tinnitus in left for last five years, for about half of the time. Manubrium retracted, but inclination normal, not movable by Siègle; other parts of membrana move somewhat naturally. Hearing of right, watch pressed left, two and a half inches. Divided tendon posteriorly; hearing not improved by the operation, but tinnitus somewhat diminished; have not seen the patient a sufficient number of times since the operation to determine exactly as to the results, he living out of town. In attempting the incision, the pointed instrument struck a portion of the membrane exactly behind the short process, and refused to enter, apparently touching a hard substance, probably the malleo-incudal articulation.

The knife was entered a little below easily, and then passed upwards, similar to the directions given in the division of the post. fold. The patient fainted under the operation, although it was not specially painful.

Case VI.

Miss D., aged thirty; old case of tympanal disease, with probable labyrinthine complication, as the deafness was very profound. I attempted division of the tensor by the method already described, without ether. The patient gave a violent start, and I only made the preliminary puncture. Ether was then used to complete narcotism. The bleeding, which was considerable, required styptics to arrest it, but at every attempt to renew the operation, the bleeding returned, so it was abandoned for the time. A somewhat violent suppuration resulted from this attempt, causing a large perforation in the membrane. Whether it was the puncture alone, or the puncture and the styptics used (Liq. Ferri Perchlo.), which caused the inflammation, I am still in some doubt. It is probable, however, that the puncture alone did not do it.

Case VII.

Henry S., aged fifty; deaf four or five years in right. Tinnitus most of the time, so as to interfere with sleep. Hearing of right, voice fifteen inches; left nearly normal hearing, and only slight tinnitus. Membrana in right appears nearly normal; mobility normal. Did tenotomy by Green's instrument on May 25. Four days after, tinnitus nearly gone; very little pain after the operation, although at the time he nearly fainted. Hearing distance as before.

Case VIII.

William Reynolds, aged fifty, has had tinnitus constantly in the left ear for one year. The other ear is affected by a chronic otitis media, with considerable diminution of hearing, but never any tinnitus. The left ear hears the voice fifteen inches. Did tenotomy without ether, by Gruber's tenotome, posteriorly; was not conscious of the moment at which the tendon was divided. There was considerable hæmorrhage, and the operation was somewhat painful. Not benefited.

Case IX.

Miss H. S., aged forty. Duration of the disease ten years. Tinnitus constant and very troublesome. Membranæ both normally mobile, position of malleus handles correct as to inclination, only somewhat foreshortened. Tenotomy done under ether, and more deliberately and carefully than usual, by Gruber's instrument, posteriorly; could not distinguish between the cutting of the membrane and the tendon. Done in this case mainly by transfixion. Hearing before the operation about five inches for the voice in each ear, and afterwards it was about one fourth farther.

The tinnitus is somewhat relieved. The patient is one of the restive kind, with apparent disturbance to the cerebral functions, which is occasionally seen in old ear cases.

Although one or two tendons were divided by transfixion, the method is not, perhaps, the best. The entering the tympanum near the end of the malleus handle, and cutting upwards until the tendon is reached, and then dividing it by an up and down movement of the tenotome, has succeeded the best in the hands of the writer.

A CASE OF SO-CALLED MÉNIÈRE'S DISEASE.

BY CHARLES H. BURNETT, M. D, PHILADELPHIA.

THE case about to be described occurred in the practice of W. Pepper, M. D., Clinical Professor of Medicine in the University of Pennsylvania, to whose courtesy is due the opportunity of examining the *aural* features of the case, and of reporting them at this time.

I shall first give Dr. Pepper's notes of the case, and the treatment which he has pursued in it since December, 1873.

"Note taken Nov. 11, 1873. John French, aged fifty; a large, heavy, strong man; works in a rolling-mill at Trenton, New Jersey; of temperate habits and without suspicion of venereal taint. Enjoyed good health until the spring of 1871, when he noticed appetite and digestion growing irregular, and had spells of marked drowsiness from time to time. Once he observed that in walking home in the evening his gait became irregular and he pitched awkwardly. In June, 1871, he was suddenly seized in the mill, while sitting down, with a sense as though 'the whole mill was coming down,' and then he immediately pitched forwards on the ground, hurting himself on the flag pavement. He thinks he did not lose consciousness. It was five minutes before he could get up, and he was unable to work for six months.

"He noticed, immediately, ringing in the left ear (like the roaring of a sea-shell, or sometimes like a little bell).

"For some months he vomited occasionally, usually immediately before being seized with a dizzy fit. He vomited

severely with the first attack. Since that time he has had very numerous similar spells, all occurring suddenly without warning; he is then seized with sudden, extreme vertigo, seeing all surrounding objects whirling *around*, and also *rising up* into the air; at the same time he feels something moving or running through his head; the ringing in the left ear increases, and seems to extend upwards to the left temple, and on reaching there he instantly falls to the ground violently, and without any power of controlling the direction of his fall, so that he has frequently hurt himself severely. Still there is never the least loss of consciousness. He knows he is falling, sees the ground and surrounding objects, and when he reaches the ground usually cries out to any one near at hand that he is not hurt and will get up in a few minutes if let alone.

"He feels intensely giddy, while on the ground, for from two to five minutes; is then able to get up, and after sitting for ten or fifteen minutes feels as usual again, or merely a little weak and shaky.

"These attacks occur very irregularly as to frequency, severity, hour of day or night, season, etc. Occasionally he passes two weeks without a spell; at other times he has them very frequently.

"His eyesight is good; appetite good and fregular, with fair digestion. Needs laxative pills occasionally. Sleep is irregular when he does not work.

"Has been in the habit of being freely cupped behind the ears and at back of head, having from six to eight fluid ounces of blood drawn every month or three weeks; also dry cups on the temples. At first, this relieved the sense of fulness and giddiness, but lately it has not afforded much benefit. Patient is not troubled with palpitation of the heart.

"December 19, 1873, patient was put upon Iodide of Potassium gr. V., Dec. 27, increased to gr. X in twenty-four hours, with thrice Digitalis gtt. X. in twenty-four hours.

"January 30, 1874. No positive benefit. Noise in the

head is as bad as ever, but has had no bad spell of vertigo for two weeks; feels weak; pulse 68. Stopped Digitalis. Is to take Fowler's Solution, gtt. V. t. d , and to continue Iodide of Potassium, gr. X., t. d.

"February 15, 1874. No benefit. To stop Iodide of Potassium and Arsenic, and take Arg. Nit. gr. $\frac{1}{3}$, t. d.

"March 1, 1874. Better. Has had but one *bad* spell since he took the Nitrate of Silver.

"April 18, 1874. Ordered to suspend pills of Nitrate of Silver, and to take Iod. Pot. gr. IV. Hydrarg. Bichlor. gr. $\frac{1}{16}$. Syr. Sarsap. comp. fzi. t. d.

"June 8, 1874. Much better. Only one attack in three weeks; still has ringing in his ear; the buzzing runs up side of head, but there is very little dizziness. To continue the mixture of Iod. Pot., Hydrarg. Bichlor., and Syr. Sarsap. c.

"June 25, 1874. He writes that his head is not so well, and he is ordered to resume pills of Nitrate of Silver."

On the 11th of November, 1873, I examined the ears of this man, and made the following notes, to which I have added others of a later date: —

The membranæ tympani presented unmistakable evidences of progressive hardness of hearing. Their lustre had disappeared, and they looked thickened.

On the left side I found absolute deafness for external sounds, with constant tinnitus, like the "roaring of a sea-shell." On the right side, hearing for watch $\frac{10}{50}$; voice, five paces, confirming the supposition of previous aural disease, based on the appearance of the membrana tympani.

Tuning-fork placed on vertex heard only on the right side, *i. e.* the better side.

Eustachian tube pervious, with difficulty, to catheter on left side.

Before the first attack of vertigo and falling, patient weighed two hundred and forty pounds; but now his weight is one hundred and eighty-five pounds.

Formerly the tinnitus, or "roaring of a sea-shell," moved

slowly upwards towards the vertex on the left side, just before an attack of vertigo; but this is not so marked now, and he no longer possesses this warning of an attack.

I saw the patient next on the 18th of February, three months after my first observation of his case. I find him looking much better, but he feels weak, and still has the attacks of vertigo, which are not, however, any more severe. He began taking, at that time, small doses of Nitrate of Silver, as will be seen from Dr. Pepper's notes. The tinnitus continued without change, and at this visit I applied 12–16 El. (S. & H.) 2,100 Rheo. with positive pole (ball-electrode) in the meatus of the affected ear. This increased the tinnitus. I then applied the negative pole, increased the number of El. to twenty, and the tinnitus was greatly diminished. He stated that the tinnitus left the interior of the head and moved to the meatus and then to the auricle. He subsequently told me that he felt this relief for several hours after he left my office.

On the 4th of April, 1874, I saw him again. The attacks of vertigo and falling are less frequent and less severe, with an interval of, at most, three days.

During the vertigo objects appear to revolve in an antero-posterior direction in a vertical plane. There is a total loss of equilibrium, but consciousness is perfect. The attacks come and go suddenly, and are followed by a cold sweat. Since the apparent motion of surrounding objects seemed to cause considerable distress to the patient, I suggested to him to close his eyes at the next attack, which he did; but he stated that he *felt* the motion in the already-described meridian, just the same.

During these attacks, when he feels that he, with all surrounding objects, is revolving from the front backwards in a vertical plane, he says that he does not appear to revolve any further than a point at which he seems to have been placed upon his back, *i. e.* if he is in a vertical position, he moves backwards 90° (= $\frac{1}{2}$ semicircular canal), while objects about him rise from the floor or ground, *i. e.*

from the horizontal position, revolve 180°, or a semicircle, and reach him, lying on the ground.

Attacks increased in frequency about the 1st of May, after which he had one attack of vertigo in a horizontal plane, from left towards the right, at which time, instead of falling backwards, he fell towards the right, or with the apparent motion.

The first feature which attracts our attention in this case, is the probability that a so-called chronic aural catarrh, or proliferous inflammation of the tympanum, existed on the left side before the attack of labyrinthine vertigo.

Proliferous inflammation of the tympanum most surely exists now on the left (the better) side, and as the membranæ are identical in their appearance, each presenting unmistakable evidences of the aforesaid disease, I believe the left side had been affected by a so-called chronic catarrh some time before, and in all probability induced the Ménière's disease by an extension of the proliferous disease to the semicircular canals.

It is also interesting to note the various planes of the apparent motion experienced by the patient during his attacks of vertigo, and the length and character of the arcs of the apparent meridians described, both by the patient's body and surrounding objects.

Most of the attacks of vertigo, always accompanied, be it remembered, by perfect consciousness, are characterized by an apparent motion in a vertical plane from front backwards, *i e.* in the plane of the superior semicircular canal.

Once the apparent motion was in the plane of the horizontal or inferior semicircular canal. The apparent motion was always *felt*, even if the patient closed his eyes, a clinical fact, entirely in harmony with the experimental observation of Mach.

This observer states that by means of his apparatus (described in the Report), by which he is enabled to apply an artificially accelerated motion to the currents of the fluid of the semicircular canals, "an individual, even without the

assistance of his eyes, is distinctly conscious of the direction of the accelerating force, whether his body be at rest or revolved with a constant velocity."

At the time of the attacks of vertigo, the apparent or subjective motion of the patient's body ceased when he reached the ground and lay upon his back, although the apparent motion of surrounding objects continued.

The paroxysmal nature of the vertigo, with temporary increase of the tinnitus, in an already diseased ear, would seem to indicate that whatever the cause of the irritation in the semicircular canals be, it is neither constant nor totally destructive of their function.

In this case we have a collection of clinical phenomena, partly of a subjective nature, most strikingly in accord with the recent brilliant and important experiments of Mach, Breuer, Cyon, and Curschmann, all of which have added many facts tending towards the conclusion that, although the semicircular canals may not be devoid of acoustic functions, they seem to possess well-marked functions presiding over the pose of the head, and *mediately* over that of the entire body.

Addendum by Dr. Pepper, Dec. 10, 1874. The patient has recently been again under observation for three months in the Hospital of the University of Pennsylvania. His general condition remains much the same. The attacks of excessive vertigo have varied in the frequency of recurrence during the past six months. A seton was introduced behind the left ear, and for some time he was kept under the influence of large doses of Bromide of Potassium, but without any lasting benefit. During the last month of his stay in the hospital, he was directed to take Iodide of Potassium again, and appeared to be benefited markedly from its use.

COLUMBIA UNIVERSITY LIBRARIES
0062041843